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THE Journal OF THE AMERICAN DENTAL ASSOCIATION

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REPORT TO HOUSE OF DELEGATES

SEPTEMBER 13, 1948

H. B. Washburn, D.D.S., St. Paul

THE office of President of the American Dental Association has given me the opportunity of visiting thirteen state society meetings and seven district meetings. In addition there were eight trips to Washington on matters concerning the Research Bill, Veterans Administration, Army and Navy dental corps, the dental division of the U. S. Public Health Service, dental research in the Bureau of Standards, dental research in the Army Institute of Pathology and a conference with President Truman. These experiences gave me a pretty clear picture of conditions within our Association from north to south and from coast to coast. I accepted every invitation offered me from state or district societies except when there was a conflict in dates. Unfortunately, several states invited me to meetings scheduled on identical dates, and because of the distances between them I could accept only the first invitation received.

This year of visiting around the country has been a year of wonderful associations, both formal and informal. I want to take this opportunity to express my sincere appreciation to all those whose cooperation made my visits so pleasant and happy, and to those whose invitations could not be accepted.

At each of these meetings it was my pleasure to meet with the state officers and the state delegates to the American Dental Association annual session. These meetings were a rich source of information that cannot be covered completely in a few paragraphs. I hope to give you some of my impressions in this message and its recommendations.

I want to say a word of appreciation to the employees in the central office and elsewhere. My appreciation stems from two circumstances. The first is that, without a single exception, your president this last year has received the fullest cooperation and definite assistance from every employee and the members of all committees, councils, commissions and bureaus. Dr. Camalier has been very helpful. The Board of Trustees has recognized fundamental issues as never before and has worked hard and faithfully to solve problems as they were presented. For the secretary I have a special word of praise. One need work with this brilliant young man only a short time to

realize his value in the position he occupies. The office of president is made much easier through his assistance.

Second, and of greater importance, is the loyalty which members and employees have shown to the Association in the face of its disturbing financial condition. Nothing is more damaging to morale than the thought of an approaching discontinuance of one's activities. Because of financial conditions we drastically curtailed many of our services, and unless we increase our revenue substantially we shall find it necessary to cut them further. However there was some blessing disguised in this situation, for it forced each agency to scrutinize its program carefully to see if there were not some nonessentials that could be eliminated. In some instances I think an entirely new point of view might be best. Therefore, one of my observations as I journeyed around was that our financial difficulty has done four valuable things for us: (1) tested the loyalty of our employees, (2) caused our agencies to examine their programs more carefully, (3) awakened our entire membership to the fact that we cannot continue to expand the services of the association to meet the demands of the membership without an increase in our income and (4) brought out the fact that the House and the Board must cooperate better in plans for the future.

As I talked with members all over the country it was apparent that they are becoming more and more conscious of the real value of the American Dental Association as it affects them personally and the public generally. Unfortunately, this consciousness of the value of the activities of the American Dental Association, and, consequently, the value of American Dental Association membership, still does not exist among a large enough majority, principally because too many members still do not read of the accomplishments of our Association. Frequently I was asked why the American Dental Association didn't do some specific thing. In many instances I could say it had been done and was recorded in THE JOURNAL, but if not, the reason was a lack of funds. Members everywhere admit they do not read THE JOURNAL as they should. One interesting suggestion, made by Dr. W. P. McGovern, past-president of the Washington State Dental Association, was that THE JOURNAL be mailed to the member's home instead of his office.

Through it all I was educated to the fact that members are demanding more and more service and activity from the Association. When the matter of dues was brought up I found practically unanimous sentiment in favor of an increase, and in most cases there was regret that the proposed increase was not more than $6. The members expressed themselves as willing to pay more if it meant continued and expanded activity, especially in view of the increased cost of everything that one undertakes in these times.

Washington, D. C.

In Washington we have responsibilities that are becoming increasingly important. Legislative matters are in the hands of a duly constituted standing committee. But purely legislative matters are only a part of the Washington picture. We have been trying for years to establish contacts on a high level and show that the American Dental Association could be of great value if consulted at the right time, but we have been denied full participation, for what reason I cannot learn. The Veterans Administration, the dental corps of the armed forces, the dental division of the Public Health Service, to name a few, should all look to the American Dental Association for assistance. I am particularly happy to be able to report to you that we are now being asked officially by these groups to participate actively in the planning and

policy making stages of their activities. This is a challenge, and we must meet it fully and effectively.

In July of this year I received a request from Major General Smith, chief of the Army dental corps, that representatives of the A.D.A. meet with officials of the Army dental corps. The meeting was held August 8 and 9, with the following in attendance from the American Dental Association: members of the Ad-Interim Committee; Drs. Morrey, Cruttenden and Camalier; Mr. Bain; Dr. Flagstad, chairman of the Committee on Legislation; Dr. Curren, chairman of the Committee on Military Affairs; Dr. Timmons, and Dr. Henry Swanson. This meeting was held at government expense.

The purpose of the meeting was to discuss the critical shortage of dental personnel at the present time and the even greater shortage predicted for the near future. Our representatives were aware of this shortage of personnel and believed that after the facts had been placed before them they could intelligently evaluate the situation and determine what action to recommend to the House of Delegates of the American Dental Association. The representatives were unanimous in their belief that any efforts in this direction must be cooperative between the American Dental Association and the Army dental corps.

There is no question but that there must be dentists to take care of the men in the armed forces. We of the American Dental Association, as an association and as individuals, realize the responsibility involved and are fully desirous of helping to maintain adequate dental personnel. The armed forces expect this assistance. But those in charge of the armed forces must come to a realization of their responsibilities. Just because we have armed forces or a peacetime army and navy is not reason enough to expect physicians and dentists to leave practices that have taken months or years to establish and enlist under any kind of regulations. The responsibility of those in charge of such matters is to point every effort toward improving conditions.

In my conference this year with the surgeon general of the Army and with General T. L. Smith and Admiral C. V. Rault, it seemed to me that they desired changes which would eliminate many or all of the criticisms advanced by those who have served or are serving in the Army dental corps or the Navy dental corps. I have a feeling that if they had their way all the objectionable features would be wiped out, but I can't understand what is preventing these changes.

After a full two-day conference, your representatives read a statement into the record pledging the cooperation of the American Dental Association, provided that complete administrative autonomy for the dental corps was established by law. A full and detailed report of this meeting will be given to the House by the Ad-Interim Committee.

The Veterans Administration

My observations of the activities of the V.A. in various parts of the country composed a very confusing picture. Directors of the dental programs in branch and regional offices interpreted regulations differently from each other and from the central office in Washington. In an effort to get at the facts I had several conferences with Dr. Kennedy, former acting director of the dental division and Dr. Magnuson, chief medical director. I had first-hand experiences to talk about because I am a participating dentist in the V.A. program. In addition, I had heard the experiences of dentists all over the country and had talked with regional and branch directors from several areas. I still don't know what causes all the trouble of one kind or another that we are having. About the only progress I can report at this time is that Dr. Magnuson assures me that practically all of the errors of commission and omis-

sion can be corrected and will be. Also, he states emphatically that he is and always has been utterly opposed to any type of administration that tells all dentists and physicians how to practice; in other words, he is against any form of socialized health service. At least I can say that I am hopeful that the perplexing problems of V.A. may soon be solved to the satisfaction of all concerned.

It was suggested to V.A. that after the examination is completed and sent in, the dentist be allowed to proceed immediately with the needed service, such as extractions, fillings and treatment of periodontal disease. Naturally there would have to be an understanding between the dentist and patient that any dental treatment not allowed by the V.A. would be paid for by the patient. The patient would decide whether he wanted to enter such an agreement, and the dentist would decide whether to treat each individual patient on this basis. Under the present plan far too much time elapses between examination and authorization, with results which too often are disastrous to the patient. It was pointed out to the V.A. that such a plan would not only save teeth and relieve discomfort, but would actually save money. Under the present plan, in many cases a request must be made, when authorization finally comes through, for a more expensive type of service because of the progress of the disease.

Health Legislation

According to a compilation sent to me by Dr. Camalier, our assistant secretary in Washington, D. C., fifty-five health bills were introduced into the Eightieth Congress, including those passed and signed by the President and those which have failed to pass both Houses or have been vetoed by the President. Of the fifty-five introduced, ten were passed and have become public laws. This large number of bills dealing with health indicates the tremendous responsibility which falls on our Committee on Legislation. The Committee must be alert at all times to these bills which are being shot into Congress almost as if out of a machine gun. The increasing number of health bills shows that the health of the people is becoming more important as a political commodity. We must hope that sooner or later the people of this country will see the futility of trying to make people healthy by merely passing laws.

Dental Research Bill

Among the major accomplishments of the year was the passage by Congress of the Dental Research Bill, which I am told has been sponsored by our Committee on Legislation for the past seven years and introduced in each succeeding Congress during that time. This last time the Senate passed the bill, but little or no action could be had from the House. Congressman Brehm of Ohio, a dentist and a member of the American Dental Association, looked into the matter, apparently discovered what was holding up House action and straightway made plans to get action. Not long afterward the Bill received favorable action. It is now law, but without provision for appropriation of the necessary funds.

Now that we have the law we must see to it, that the program is administered in accordance with the original plans. It is my earnest hope that political interference will be eliminated completely in these plans. Surely those persons to whom the administrative organization is entrusted should be sensible enough and honest enough to stifle any attempts which may be made to control dental research politically. Notwithstanding such present and future problems pertaining to the Dental Research Law, we must acknowledge with sincere appreciation the fine work done by the Committee on Legislation, Congressman Brehm, the Surgeon General and the U. S. Public

Health Service in securing the passage of this important law. General Scheele assures us that we will have a separate building, in spite of pressure to the contrary.

Need for a New Committee

During this last year it has become evident to me that many problems come up that are of national emergency proportions, but are outside the scope of duties of any of our committees. Our Committee on Legislation can handle the legislative aspects of many such problems, and the Committee on Military Affairs can handle problems relating to regular and reserve personnel. However, there is no committee to coordinate the complex and difficult problems of procurement, civilian dental needs, deferment of dental and predental students and many others. A special committee on national emergency dental service would be of great value to your administrators.

Dental Education

Lack of facilities for educating more than a fraction of the students who desire to enter the profession of dentistry is causing a great deal of agitation and distress in many sections. The Council on Dental Education, under the able direction of Dr. Harlan H. Horner, is fully cognizant of the situation and has rendered a splendid service in building up dental school facilities to a high point of efficiency. The Council is also encouraging every effort toward the establishment of new schools of dentistry in strategic parts of the country.

The following quotation from Dr. Horner's book, *Dental Education Today,* illustrates the thinking of the Council:

> American dental schools have clearly won world leadership. They have won that leadership primarily because of the premium they have put upon fine craftsmanship. If they are to retain that leadership down through the coming years, they must materially broaden the base of their objectives, as many are happily already doing, and train scientists as well as craftsmen, men as well as dentists. This changed outlook does not entail less emphasis, though possibly less time, upon mechanical dexterity; but it does mean more emphasis—vastly more—upon the preservation of health, the prevention of disease, and the recognition of dentistry, though separately organized and administered, as a worthy inherent unit of the healing art.

I am informed that last year there were seven thousand applicants, in addition to the three thousand accepted, who were eligible but could not enter dental school because of the lack of facilities of one kind or another. This condition inhibits the much needed expansion in dental personnel. It throws a heavy burden on the deans and acceptance committees, as their selections are subject to severe criticism from several sources. The greatest hardship comes to those prospects who live in states that do not have schools of dentistry. Most dental schools are statewide tax-supported institutions, the body politic paying the difference between tuition and the cost of educating a dentist. It has been suggested that a state not supporting a dental school arrange to pay this difference to the school selected by one of its own citizens who desires to study dentistry.

Oral Surgery

The question of what constitutes oral surgery, and whether the service should be rendered by dentists or physicians, has reached the point where a decision must be made. Oral surgery was pioneered by dentists and it must remain in the hands of qualified dental practitioners.

Commission to Study Dental Problems

It has been called to my attention that engineering, law, pharmacy, medicine, nursing and hospital administration have initiated studies of some of the long range

problems in those professions. The American Medical Association has nine separate committees working on the various phases of such a study at the present time. I have been informed that there is an agency which might be willing to finance such a study in dentistry. It seems to me that this would be the right time for the American Dental Association to institute such a program.

Delegates' Responsibility

I have oulined some of my observations concerning what I consider to be important issues before us at this time. I have tried to avoid encroaching on reports of the committees, councils, commissions and bureaus which have come before you at this meeting. All of these agencies have worked hard and faithfully, and I hope you will treat their reports and recommendations in a fair-minded and helpful manner. Meeting here as the House of Delegates, please remember that you represent approximately seventy thousand dentists who are looking to you for a solution of the many problems that confront the profession. It is a great responsibility, and as I look at you collectively and individually, I have a definite feeling that this House of Delegates is ready and willing to put personal and sectional ambitions aside and consider the measures that will come before it in the spirit of what will be best for the dental profession and the American people, rather than for any one particular group or section.

DR. WASHBURN'S RECOMMENDATIONS

1. That the American Dental Association continue to direct every sensible effort toward securing laws relative to the armed forces that will provide dentistry with its own administrative authority, separate from medicine and responsible only to the commanding officer.

2. That every sensible effort be made to secure full cooperation between the Veterans Administration and the American Dental Association.

3. That the House of Delegates authorize the secretary to direct a letter to the surgeon general of the United States Public Health Service expressing appreciation for the decision to provide a separate building for the National Institute of Dental Research.

4. That the House of Delegates authorize the president of the American Dental Association to appoint a special committee on national emergency dental service to aid in the coordination of the Association's policy and program in regard to any future national emergency.

5. That prompt steps be taken by the proper agencies to secure a solution of the problem confronting us in the field of oral surgery.

6. That the House of Delegates authorize the Board of Trustees to appoint a commission to investigate the possibilities of conducting a comprehensive long range study of dental problems and practice, similar to studies now being conducted by many other professions.

A PRACTICAL METHOD FOR PREVENTION OF DENTAL CARIES

David J. Goodfriend, D.D.S., Philadelphia

DENTAL caries is the principal cause of the breakdown of the masticating mechanism and thus affects the health, comfort and happiness of humanity. The diseases and loss of tooth support and function that are caused by caries in turn cause facial disfigurement, reduced masticating comfort and efficiency, gastro-intestinal disturbances, deafness, vertigo, neuralgia, pyorrhea and focal infections.

Methods of Prevention

The prevention of dental caries can be accomplished by removing or destroying its causes or by increasing the resistance of the tooth. There are five methods to prevent caries: (1) by altering the carbohydrate content of the diet, (2) by increasing the resistance of tooth structures to dissolution by acids, (3) by cleansing away carbohydrate food debris from the retaining areas of the teeth, (4) by preventing bacteria from forming caries-producing acid in carbohydrate foods on the tooth surfaces and (5) by neutralizing caries-producing acids formed by bacteria in the fermentation of carbohydrates on the surfaces of the teeth.

The mechanism of caries first was recognized by Miller[1] in 1890. He said:

> Dental decay is a chemico-parasitical process consisting of two distinctly marked stages: decalcification, or softening of the tissue, and dissolution of the softened residue. In the case of enamel, however, the second phase is practically wanting, the decalcification of the enamel practically signifying its total destruction. . . . [The acids which effect the decalcification] are derived chiefly from particles of amylaceous [starchy] and saccharine substances which lodge in the retaining-centers and there undergo fermentation.

In a series of classic experiments, Miller demonstrated that there exists in the saliva a substance which can break down carbohydrates to form lactic acid. He assumed that this was a bacterial process because production of caries in teeth in the test tube was inhibited by the boiling of the saliva and by the addition of an antiseptic. Miller's estimation of the cause of caries remains substantially unaltered today and is accepted as a scientific fact.

Among the groups of workers who recently have studied the various aspects of caries are those workers at the University of Michigan, sponsored by the Kellogg Foundation; those at Columbia University, sponsored by the Carnegie Corporation and the Commonwealth Fund; those at Tufts College Dental School, and those at the University of Chicago, under the direction of the Zoller Memorial Dental Clinic.

The Michigan group studied the relation of the number of acid-forming bacteria to the incidence of caries and the influences that affect the oral flora.

The Columbia group, by conducting experiments on rats and observing relations between diet and caries in Eskimo settlements, studied specific food factors that cause caries.

The Tufts group studied the influ-

1. Miller, W. D., *The Micro-Organisms of the Human Mouth*. Philadelphia: S. S. White Dental Mfg. Co., 1890, p. 205.

ence of chemicals on the resistance of tooth structure to dissolution by acids.

The University of Chicago group studied the factors that inhibit the bacterial formation of acids and those that neutralize acids so formed.

Bacteria and Carbohydrates

The Michigan group has shown a correlation between a high carbohydrate content of the diet, a high Lactobacillus acidophilus count and a large amount of caries. Koehne, Bunting and Morrell[2] showed that when the diet was high in carbohydrates the number of oral bacteria that cause the formation of lactic acid with the fermentation of carbohydrates was high and the incidence of caries likewise was high. Their experiment was conducted in the University of Michigan Hospital, on children ranging in age from 6 to 13 years, with normal metabolism and under complete dietary control. When the carbohydrate content of the diet was minimized over a period of months, the number of acidogenic bacteria was reduced markedly and there was an apparent arrest of the caries process. When the carbohydrate content of the diet of some of the children was increased, the number of acidogenic bacteria increased and the incidence of caries also was increased. The children whose diet remained low in carbohydrates continued to have low lactobacillus counts and a low incidence of caries. The hospital's student dietitians voluntarily restricted the carbohydrate content of their diet, and similar results were obtained. An important finding made in these and other experiments by the Michigan group was that persons with an immunity to caries also have a resistance to the elevation of the number of oral lactobacilli. These findings have been corroborated by Koehne, Bunting, Jay, Crowley, Hard, Keller, Hadley and others working at the University of Michigan.[3-7]

Rosebury, Karshan and Foley,[8] of the Columbia University group, showed in the experimental production of caries in rats, which is similar to the caries found in human beings, that the specific causative agents of caries are coarse crumbing carbohydrates such as grains of uncooked wheat and rice, or hard biscuits such as pilot bread. In experiments with rats, they found that diets with pieces of uncooked rice and wheat kernels caused sulci and interdental caries. Those rats fed on a similar diet which was finely ground and sieved had no caries. Autopsy studies showed that the caries occurred under uncooked pieces of rice and wheat wedged between the teeth.

In a study of caries among Alaskan Eskimos, Karshan and Rosebury[9] found three settlements of Eskimos with varying amounts of caries, under varying dietary conditions. A primitive settlement called Kenuk had no tooth decay. A settlement called Eek, which had a resident white trader, had much caries. An orphanage, run by white missionaries, had only about half as much caries as did the Eek settlement. The diet at Kenuk was completely primitive. That at Eek was largely primitive with the exception of a few foods introduced by the white trader. The orphanage had the

2. Koehne, M.; Bunting, R. W., and Morrell, E., Control of Dental Caries in Children. *J. Diseases Children* 48:6, 1934.

3. Koehne, M., and Bunting, R. W., Studies in Control of Dental Caries. *J. Nutrition* 7:657 (June) 1934.

4. Jay, Philip; Crowley, Mary; Hadley, Faith P., and Bunting, R. W., Bacteriologic and Immunologic Studies on Dental Caries. *J.A.D.A.* 20:2130 (December) 1933.

5. Bunting, R. W.; Crowley, Mary; Hard, Dorothy G., and Keller, Margaret, The Prevention of Dental Caries Through the Limitation of the Growth of Bacillus Acidophilus in the Mouth. *J.A.D.A.* 16:224 (February) 1929.

6. Bunting, R. W.; Nickerson, Gail, and Hard, Dorothy G., Further Studies of the Relation of Bacillus Acidophilus to Dental Caries. *D. Cosmos* 68:931 (October) 1926.

7. Hadley, Faith P.; Bunting, R. W., and Delves, Edna A., Recognition of Bacillus Acidophilus Associated With Dental Caries: A Preliminary Report. *J.A.D.A.* 17:2041 (November) 1930.

8. Rosebury, Theodor; Karshan, Maxwell, and Foley, Genevieve, Studies in the Rat of Susceptibility to Dental Caries: A Review of Four Years of Research. *J.A.D.A.* 22:98 (January) 1935.

9. Karshan, Maxwell, and Rosebury, Theodor, Biochemical Characteristics of Saliva of Kuskokwim Eskimos Correlated With Dental Caries and Salivary Calculus (Abstract). *J. D. Res.* 16:307 (August) 1937.

most complete white man's diet, with the best balance of protein, fat, calcium, phosphorus, milk and vitamin D. The strictly primitive Eskimo diet is associated with freedom from caries. This freedom from caries is dependent on the absence of a caries producing factor in the diet rather than on the preventive effect of anything in the primitive diet, because with the introduction of certain white man's foods, as at Eek, rampant caries develops.

Rosebury and Karshan decided after a study of the diet at Eek that the specific factors causing caries were rich carbohydrate foods that pack in the retaining areas of the teeth; that is, certain types of candy and a hard crumbing biscuit called pilot bread. They found that pilot bread is the food most likely to be given to primitive peoples by explorers and they attributed to it the fact that white explorers frequently introduce caries to primitive peoples. Rosebury, Karshan and Foley[8] introduced pilot bread into the diets of experimental rats and found that it produced caries similar to that caused by the coarse grains of wheat and rice.

The explanation of the cause of caries that has received the most recognition in the lay mind is that advanced by Wallace[10] in 1900. This explanation, based on the prevalence of caries among civilized people and its absence among primitive peoples, maintained that the soft texture of civilized foods was the cause of caries. Wallace contended that the natural unrefined fibrous carbohydrate foods do not lodge in the retaining areas of the teeth but actually exert a detergent effect and clean the teeth during the vigorous mastication necessitated by their texture. In 1912 Wallace[11] said that the pre-eminent cause of the prevalence of tooth decay is the elimination of fibrous matter which accompanies carbohydrates in their natural state and their presentation in a form that readily lodges in the teeth and undergoes fermentation in the mouth.

> Fourteen children have been [reared on the "detergent" diet] and at ages ranging from 5 to 7 years their teeth were examined with the result that not one tooth of any of these children showed the slightest trace of caries. This may not seem a large number, but when we remember that in England a similar number of children of the same class would certainly have had eighty to ninety carious teeth among them at the same age, we see that according even to this alone there is overwhelming probability or practical proof that the theory is correct.

Thus these researches corroborate Miller's hypothesis and reiterate that which has been known for fifty-seven years: that certain carbohydrate foods, peculiar to the civilized diet, pack in the retaining areas of the teeth and undergo bacterial fermentation to form acids that cause caries. Despite this knowledge, the public has not altered the carbohydrate content of its diet, nor abstained from eating sweets or otherwise changed the so-called white man's diet.

The validation of Miller's hypothesis and Wallace's convincing evidence has been accepted by the public as proof that caries is caused by oral conditions resulting from the eating of certain foods, and detergency has been accepted as the basis for prevention. This has influenced the use of home hygienic precautions such as the toothbrush and dentifrices and has unquestionably reduced the incidence of caries.

Bödecker[12, 13] has shown that the fissures of the teeth frequently are too narrow to be reached by the bristle of the toothbrush. The contact areas between the teeth also are difficult to reach, and

10. Wallace, J. S., *The Cause and Prevention of Decay in Teeth*. London: Churchill, 1900.
11. Wallace, J. S., *The Prevention of Caries*. London: Dental Record, 1912, edition 2, p. 51.

12. Bödecker, C. F., Preliminary Communication Upon a New Method of Decalcifying Structures Containing Minute Quantities of Organic Matter, With Special Reference to the Enamel. *D. Review* 19:448 (May 15) 1905.
13. Bödecker, C. F., The Tooth Brush in Relation to Occlusal Fissures. *D. Items Interest* 48:161 (March) 1926.

it is in these areas that caries continues to be most prevalent.

Application of Chemicals

The group at Tufts College Dental School, and others who are experimenting with the application of compounds of fluorine, lead, silver and other chemicals to the teeth, hope to prevent caries by increasing the resistance of tooth substances to dissolution by acid. Bibby,[14] Klein,[15] Weaver,[16] Buonocore and Bibby[17] and others have shown that enamel can be made more resistant to dissolution by acids only during the period of eruption of each individual tooth. There is agreement that fluorine and, by inference, other chemicals cannot prevent caries in the erupted tooth. Since the application necessary to accomplish prevention or control of caries requires approximately five treatments during the eruption of each tooth and since it has not been proved that these applications will prevent decay of erupted teeth, it is evident that application of fluorine or chemicals to the teeth or the ingestion of them in drinking water or in the form of tablets is not a practical method of prevention of caries.

Formation of Acids

Three methods in the practical prevention of caries remain: cleaning the tooth surfaces in the crevices and interdental areas, preventing formation of caries-producing acid on the tooth surfaces and neutralizing acids formed on the tooth surface. In this connection the findings of Stephan, Miller, Baker, Harrison, Munz, Bradel and others working under the direction of J. R. Blayney at the University of Chicago are of interest. These workers found that dissolution of enamel occurred when the medium had a pH of 5.5 or less. The concentration of acid on the tooth surface caused by bacterial fermentation of carbohydrates in turn caused dissolution of the enamel, provided the pH was 5.5 or lower. This was called the critical index of caries. It was concluded that any substance that would prevent the formation of acid of a concentration of pH 5.5 or less in carbohydrate food debris would prevent caries.

Stephan and Miller[18] found that rinsing the mouth with glucose solution lowered the pH of plaque material on the surfaces of teeth within the range of the critical index of caries. Thus, in a group whose plaque material had an average pH of 6.17, the glucose rinse lowered the pH to an average of 4.93. The pH remained in the critical index from twelve to twenty minutes, when the material returned to its original pH.

Marshall,[19] Karshan, Krasnow and Krejci[20] and Krasnow,[21] in three independent studies of saliva of groups with rampant caries and of those with no caries, found that the one constant factor was the titratable alkalinity of the saliva, which was constantly higher in the saliva of caries-free patients. The titratable alkalinity refers to the ability of a substance to neutralize acid and has no relation to pH. In saliva the ability to neutralize acid is the property of its content of urea. Urea is changed by the presence of aciduric bacteria into ammonium bicarbonate. Thus a solution of urea is capable of neutralizing acid caused by

14. Bibby, B. G., Use of Fluorine in Prevention of Dental Caries. III. A Consideration of the Effectiveness of Various Fluoride Mixtures. *J.A.D.A.* 34:26 (January 1) 1947.

15. Klein, Henry, Dental Caries Experience in Relocated Children Exposed to Water Containing Fluorine. I. Incidence of New Caries After 9 Years of Exposure Among Previously Caries-Free Permanent Teeth. *Pub. Health Rep.* 60:1462 (December 7) 1945.

16. Weaver, Robert, Fluorine and Dental Caries: Further Investigations on Tyneside and in Sunderland *Brit. D. J.* 77:185 (October 6) 1944.

17. Buonocore, M. G., and Bibby, B. G., The Effects of Various Ions on Enamel Solubility. *J. D. Res.* 24: 103 (April) 1945.

18. Stephan, R. M., and Miller, B. F., Quantitative Method for Evaluating Physical and Chemical Agents Which Modify Production of Acids in Bacterial Plaques of Human Teeth. *J. D. Res.* 22:45 (February) 1943.

19. Marshall, J. S., Dental Caries and Pulp Sequelae Resulting From Experimental Diets. *J.A.D.A.* 14:3 (January) 1927.

20. Karshan, Maxwell; Krasnow, Frances, and Krejci, Laura E., A Study of Blood and Saliva in Relation to Immunity and Susceptibility to Dental Caries. *J. D. Res.* 11:573 (August) 1931.

21. Krasnow, Frances, Biochemical Studies of Dental Caries (Abstract). *J. D. Res.* 12:530 (June) 1932.

bacteria, because the bacteria also change urea to ammonium bicarbonate.

Stephan and Miller, utilizing these facts, had their patients rinse their mouths with a solution of urea ten minutes before rinsing with glucose. The urea rinse elevated the pH of the plaque material of this group to an average of 7.93. The glucose rinse lowered the pH to an average of 6.66, and at no time were any of this group within the critical index of caries. This study shows that a rinse of urea solution buffers plaque material on tooth surfaces so that ten minutes later the plaque material resists the formation of caries-producing acid, which ordinarily is formed by a glucose rinse.

Baker, Harrison and Miller[22] studied the effect of various synthetic organic detergents on the metabolism of oral lactobacilli. Although these workers found that practically all of these compounds inhibit the metabolism of lactobacilli, Jay and Esser[23] showed that killing the lactobacilli is not an effective method of lowering the number of lactobacilli for any practical length of time or of preventing caries.

Saprophytic bacteria are biologic scavengers which swarm to debris or foreign matter. It is impractical to prevent tooth decay by killing lactobacilli or by lowering the number of oral bacteria by bactericidal methods. But it is practical to render aciduric bacteria incapable of forming acid strong enough to cause decay in the carbohydrate debris packed in the retaining areas of the teeth.

Miller, Muntz and Bradel[24] studied the inhibitory effect of a synthetic organic detergent on the acid-forming capacity of plaque material on the teeth. They removed the plaque material from one side of the mouth of 12 patients and incubated it in twelve tubes of glucose mediums. They then swabbed similar regions on the other side of the patients' mouths with the detergent solution and permitted the patients to talk and salivate for ten minutes. The plaque material from the swabbed areas was removed and similarly incubated. The findings showed that the plaque material removed before the application of the detergent solution readily caused the formation of copious amounts of lactic acid from the glucose mediums. The plaque material that had been exposed to a detergent solution before removal from the teeth did not produce any lactic acid from the glucose mediums in 11 of the 12 cases. In the twelfth the amount produced was much less than that produced by the untreated material.

These findings and those of Stephan and Miller show that solutions of urea and a synthetic organic detergent prevent the formation of decay-producing acid on the surface of teeth for ten minutes after their use in the mouth.

Method

My interest in a practical method for the prevention of caries was stimulated by my clinical experiences with a technic that I developed for the correction of abnormalities of bite.[25-28] The first stage of the treatment utilizes corrective bite overlays that are cemented to the unprepared teeth. These overlays inevitably formed food retaining areas around the necks of the teeth and between the teeth, which in turn caused rampant decay of the covered teeth and endangered my technic and research. In response to this need, I developed a detergent-urea

22. Baker, Z.; Harrison, R. W., and Miller, B. F., Action of Synthetic Detergents on Metabolism of Bacteria. *J. Exper. Med.* 73:249 (February) 1941.

23. Jay, Philip, and Esser, Ann, Further Studies of the Etiology and Control of Dental Caries. *J.A.D.A.* 17:1117 (June) 1930.

24. Miller, B. F.; Muntz, J. A., and Bradel, S., Inhibitory Effect of Quaternary Ammonium Synthetic Detergent on Metabolism of Dental Plaque Material. *Proc. Soc. Exper. Biol. & Med.* 45:104 (October) 1940.

25. Goodfriend, D. J., Dysarthrosis and Subarthrosis of the Mandibular Articulation. *D. Cosmos* 74:523 (June) 1932.

26. Goodfriend, D. J., Symptomatology and Treatment of Abnormalities of the Mandibular Articulation. *D. Cosmos* 75:844 (September); 947 (November); 1106 (December) 1933.

27. Goodfriend, D. J., Abnormalities of the Mandibular Articulation. *J.A.D.A.* 21:204 (February) 1934.

28. Goodfriend, D. J., The Role of Dental Factors in the Cause and Treatment of Ear Symptoms and Disease. *D. Cosmos* 78:1292 (December) 1936.

mouthwash that is effective in preventing tooth decay in these cases.

In my experiments I have been using a mouthwash of a synthetic detergent and urea for eight years. The combination of the urea and a nontoxic, nonirritating detergent is an improvement on urea alone, because the synthetic detergents have other important properties that add to the stability and effectiveness of the urea and that are of themselves important aids in the prevention of caries. These properties are: (1) low surface tension that enables the solutions to penetrate otherwise inaccessible crevices and areas; (2) wetting-out properties that enable the solution to penetrate and thoroughly saturate carbohydrate debris and foreign matter on the teeth; (3) spreading coefficient that permits the solution to spread between the surfaces of foreign matter and the teeth and to break their affinity for each other; (4) emulsification with movement that enables the solution to throw into suspension insoluble debris, and (5) detergency that enables the solutions to clean away carbohydrate debris, plaque material and other foreign matter from the retaining surfaces of the teeth.

The importance of these properties in a solution of urea used as a mouthwash to prevent caries is shown by reference to the requirements of such a preparation. As stated previously, the three important factors in the prevention of tooth decay are cleansing of the crevices and interdental surfaces of the teeth, preventing the formation of caries-producing acid in the carbohydrate debris on the tooth surfaces and neutralizing acids that may form. The urea and the synthetic detergent prevent the formation of caries-producing acid and neutralize acids that may occur because they penetrate, saturate and buffer the carbohydrate food debris. The detergent is an efficient wetting-out cleanser and cleans away food debris from the surfaces of the teeth. If it does not clean away the debris, it saturates it and inhibits the action of acid-forming bacteria. The urea becomes ammonium bicarbonate in the presence of bacteria and thereby neutralizes any acid that may be formed in the food debris. Thus, acting together, the urea and the detergent clean the crevices and interdental surfaces of the teeth, prevent the formation of caries-producing acid in carbohydrate food debris on tooth surfaces and neutralize acids that may be formed.

The formula of the mouthwash I use is as follows: 40 Gm. of sodium alkyl aryl sulfonate, 80 Gm. of carbamide or urea, 1 drachm of flavoring and 1 grain of color to 1 gallon of pure water (distilled water is frequently acid).

Findings

I have applied this mouthwash for the prevention of caries in a group of 186 patients whose treatment for abnormalities of bite included the placement of fixed bite overlays that were retained on the teeth for from six months to two years. The results in these cases may be compared with those obtained in treatment of a similar group from 1925 to 1938 before this mouthwash was used. In both groups there was an unavoidable packing of food around the gingival margins and in the interdental spaces of the teeth covered by the bite-raising appliance. In the control group there was such a high incidence of caries that it interfered with treatment of the bite and frequently caused the loss of teeth. The use of the mouthwash of urea and detergent has reduced the incidence of caries in these patients by 55 to 95 per cent. The use of bite overlays in patients whose diets were unchanged increased the amount of food debris and elevated the L. acidophilus count. In my opinion, this showed a correlation between the amount of carbohydrate debris in the mouth and the lactobacillus count.

The use of any mouthwash temporar-

ily reduces the lactobacillus count. It was not the temporary reduction of the lactobacillus count that reduced the incidence of caries in the patients treated since 1938. The results achieved by the urea-detergent mouthwash were accomplished by the specific inhibition of the lactobacilli in the food debris on the tooth surface and by the neutralization of decay-producing acid that they may have generated. Thus under controlled conditions, over a period of eight years, in a group of almost 200 persons, the mouthwash of urea and a synthetic detergent reduced the incidence of caries an average of 75 per cent, as compared with the caries incidence of a similar group of persons who did not use this mouthwash and who were treated under similar circumstances.

Since this mouthwash was effective in inhibiting caries in the patients I treated for correction of bite abnormalities, it should effectively prevent caries caused by the specific conditions presented by Rosebury, Karshan, Wallace and others. In this connection, I have observed the clinical results of the use of this mouthwash in conjunction with various types of banded orthodontic appliances and in general practice in conjunction with a program of preventive dentistry. The prevention of caries in both groups has been spectacularly high and, I think, directly attributable to the mouthwash, although there were no control groups treated under similar circumstances for comparison.

I have found this mouthwash, in addition to being an effective preventive of caries and a pleasant mouth refresher and deodorant, to be a valuable adjunct to operative and surgical dental procedures. In a manner which I do not understand, it will stop bleeding without soiling or contaminating the field as most hemostatic agents do. Held in the mouth for three to five minutes after tooth extraction, it usually completely controls bleeding and leaves an uninjured wound full of clotted blood. Sprayed on bleeding gingivae during scaling or cavity preparation, it controls the bleeding and cleans the operative field. The use of this mouthwash in these manners and in the drinking cup has given me the opportunity to discuss with my patients its use in the prevention of caries. This has stimulated interest in the preventive phases of dentistry and has made the patients cooperative in the program of preventive dentistry and observant regarding the effectiveness of the mouthwash in the prevention of caries.

In the program of preventive dentistry I emphasize the value of a thorough diagnosis and periodic bitewing roentgenograms. I give thorough instructions for the home care of the mouth and teeth and recommend that a mouthful of my mouthwash be swished around and between the teeth for one minute after eating and after toothbrushing.

Thus the method for practical prevention of tooth decay that I recommend consists of thorough dental diagnosis and treatment and the use of my mouthwash, of urea and sodium alkyl aryl sulfonate, after eating.

Comment

The cause and prevention of dental caries have been reviewed, and methods of caries prevention have been subjected to the test of practicality.

The primary cause of caries is dissolution of the enamel resulting from acids produced by the fermentation of carbohydrate food debris on the surfaces of the teeth.

There are five methods of preventing tooth decay. The best is the elimination of refined, hard-crumbing, tenaciously packing carbohydrate foods from the diet. This method has been more or less known for the past fifty-seven years, and the fact that the public has not altered its diet proves the impracticality of this method of preventing tooth decay.

This article has indicated that the

practical method for the prevention of tooth decay is the use, after eating, of a mouthwash that washes away food debris from the tooth surfaces, buffers the food debris against the formation of caries-producing acids and neutralizes any acids that may be formed. A mouthwash of urea and sodium alkyl aryl sulfonate reduced the incidence of caries an average of 75 per cent in a group of patients wearing fixed overlays for the correction of abnormalities of bite as compared with a similar group who did not use the mouthwash. These patients were treated in conjunction with researches on the reflex symptomatology of dental bite defects, under the auspices of the Edward C. Kirk Research Fund of the University of Pennsylvania.[29]—*901 Medical Arts Building.*

29. Goodfriend, D. J., Deafness, Tinnitus, Vertigo and Neuralgia. *Arch. Otolaryng.* 46:1 (July) 1947.

Solubility of Fibrin Clots.—It is generally assumed that the fibrin clot formed by the action of thrombin in fibrinogen solutions or in oxalated plasma is the same as that formed during blood clotting or during the clotting of recalcinated plasma by its own thrombin. There are, however, marked differences between fibrin clots with respect to their solubilities. A clot obtained in purified fibrinogen solution or in oxalated plasma by the action of purified thrombin dissolves readily when an equal volume of 60% urea is added to the clot. The clot formed in recalcinated plasma by its own thrombin, however, does not dissolve in urea solution.

It was found that two factors together are responsible for rendering the clot insoluble in urea solution: one of them is the calcium ions and the other is some serum component which seems to be thermolabile. Adding these two factors in sufficient concentrations to purified fibrinogen prior to the addition of thrombin, the clot formed will be insoluble. Neither the calcium ions nor oxalated serum alone renders the clot insoluble. These observations are in accordance with the results of Kenneth C. Robbins *(Am. J. Physiol.* 142:581, 1944), who studied the solubility of fibrin in weak acids and alkalies.

A detailed account of this work will appear shortly in *Acta Physiologica Hungarica.—K. Laki and L. Lóránd, "On the Solubility of Fibrin Clots," Science 108:280, September 10, 1948.*

STUDIES IN DENTAL PUBLIC HEALTH ADMINISTRATION

IV. DENTAL CARIES EXPERIENCE OF NEW JERSEY SCHOOL CHILDREN

J. M. Wisan, D.D.S., M.S.P.H., and N. W. Chilton, D.D.S., M.P.H.,
Trenton, N. J.

In 1938, Klein, Palmer and Knutson[4] introduced the concept of measuring the dental caries experience of school children by determining the average number of decayed, missing or filled teeth. This measurement, the DMF[5] rate (in terms of permanent teeth or tooth surfaces), has since come into wide usage by public health dentists to measure the dental caries experience by age and locale, to ascertain the effect of caries inhibitory agents that occur naturally, such as fluoride salts in the public water supply, and also to determine the effects of public health programs.

In measuring the caries experience of deciduous teeth, great difficulty was encountered, because of the great variation between chronologic and physiologic age, in attempting to determine whether a missing tooth had been extracted or had been exfoliated normally. Gruebbel,[6] therefore, proposed the use of "def" as a measurement of dental caries experience in deciduous teeth; the "e" designates only those teeth which require extraction at the time of examination. This he called the "observable caries experience of deciduous teeth."

Studies have been performed by voluntary agencies, by official public health agencies on a local and state level and by the United States Public Health Service in selected areas throughout the country to establish the level of dental caries experience of school children. With the exception of the recent paper by Knutson, Maday and Jordan,[7] however, no study has attempted to compare the caries experience rate of large numbers of children in different age groups in a specified area in one decade with those of the next decade. In the study by Knutson and coworkers, comparisons were made between the caries experience rate of 2,627 children in 1940 and 2,310 in 1946 in the same county to test out a new procedure for obtaining this information rather than to determine the actual change in caries experience. Since information on changes in the caries experience rate may prove

From the Division of Dental Health, New Jersey State Department of Health. This is the fourth in a series of articles on dental public health administration. The first three articles were published in earlier issues of THE JOURNAL,[1,2] and in the *Journal of Dental Research*.[3]

1. Wisan, J. M.; Galagan, D. J., and Chilton, N. W., Studies in Dental Public Health Administration: I. Cost Analysis of the New Jersey Dental Treatment Program, 1944-1945. *J.A.D.A.* 34:302 (March 1) 1947.

2. Wisan, J. M., and Chilton, N. W., Studies in Dental Public Health Administration: III. Administrative Factors in a Dental Treatment Program as Measured by Lost Time Analysis. *J.A.D.A.* 36:39 (January) 1948.

3. Chilton, N. W., and Greenwald, L. E., Studies in Dental Public Health Administration: II. The Role of Roentgenograms in Public Health Dental Surveys. *J. D. Res.* 26:129 (April) 1947.

4. Klein, H.; Palmer, C. E., and Knutson, J. W., Studies on Dental Caries. I. Dental Status and Dental Needs of Elementary School Children. *Pub. Health Rep.* 53:751 (May 13) 1938.

5. In order to record the number of permanent teeth in which decay had progressed too far to allow for restoration by filling, the teeth indicated by M were subdivided into those which previously had been extracted (Mp) and those which required extraction at the time of examination (Mr).

6. Gruebbel, A. O., A Measurement of Dental Caries Prevalence and Treatment Service for Deciduous Teeth. *J. D. Res.* 23:163 (June) 1944.

7. Knutson, J. W.; Maday, Cecelia, and Jordan, W. A., Simplified Appraisal of Dental-Health Programs. *Pub. Health Rep.* 62:413 (March 21) 1947.

Table 1.—Dental caries experience in deciduous teeth of 61,612 New Jersey school children, 1944-1946

Age at last birthday, years	Children	Decayed teeth needing fillings d	Requiring extraction e	Satisfactorily filled f	def teeth	def teeth per child
4	60	155	17	14	186	3.10
5	3,418	8,953	2,418	986	12,357	3.62
6	5,364	14,361	5,613	2,784	22,758	4.24
7	5,442	12,085	7,651	3,707	23,443	4.30
8	5,475	9,536	7,968	3,819	21,323	3.89
9	5,597	7,076	6,655	2,813	16,544	2.95
10	5,296	4,061	4,464	1,926	10,451	1.97
11	5,468	1,880	2,626	901	5,407	0.99
12	5,088	677	1,243	327	2,247	0.44
13	4,981	190	457	91	738	0.15
14	4,851	114	218	58	390	0.08
15	4,337	78	100	18	196	0.05
16	3,422	11	34	13	58	0.02
17	2,266	7	9	0	16	0.01
18	475	2	4	1	7	—
19	66	0	2	0	2	—
20	6	0	0	0	0	—

of value in the evaluation of the effect of education of the public and the dental profession on the preservation of dental health in children, the dental caries experience of New Jersey school children in 1933-1934 and in 1944-1946 is herein presented.

Methods and Materials

In order to determine the dental caries experience and dental needs among school children in rural and suburban areas in New Jersey, the Division of Dental Health of the New Jersey State Department of Health conducted dental surveys in local communities. Local dental societies designated dentists, who were compensated for their work, to perform these surveys under the technical supervision of the Division of Dental Health. Examining dentists used mouth mirrors and explorers, recording their observations on forms recommended by the American Association of Public Health Dentists.[1, 8, 8] Data were obtained on 61,612 children, from 4 to 20 years of age, in 1944-1946.

In 1933-1934, acting on a resolution of the American Dental Association, the New Jersey Dental Society and the New Jersey State Department of Education, in cooperation with the United States Public Health Service, performed a dental survey of 259,307 New Jersey children, aged 6 to 14 years.[9] The data obtained from this survey were tabulated according to communities and sex in terms of items per 100 children. It was a simple matter to total the respective items for the eighty community entries. The totals then were divided by twice the number of community entries listed (male and female) and then by 100, to obtain the data per child, so that these items could be compared with those obtained from the 1944-1946 survey.[10]

8. Wisan, J. M., Coordination of Dental Programs. *New Jersey Municipalities* (February) 1945.

9. Messner, C. T.; Gafafer, W. M.; Cady, F. C., and Dean, H. T., Dental Survey of School Children, Ages 6-14 Years, Made in 1933-34 in 26 States. *Pub. Health Bull.* 226:125 (May) 1936.

10. It is believed that in view of the large number of items averaged and the apparent lack of any systematic variation, any appropriately weighted average would give essentially the same results as the unweighted average used. Furthermore, this latter method recommends itself because of its simplicity.

Table 2.—Dental caries experience of 61,612 New Jersey school children, 1944-1946

Age at last birthday, years	Children	Decayed teeth needing fillings D	Previously extracted Mp	Requiring extraction Mr	Satisfactorily filled F	DMF teeth	DMF teeth per child
4	60	0	0	0	0	0	0
5	3,418	262	71	37	25	395	0.12
6	5,364	2,948	116	72	217	3,353	0.64
7	5,442	6,832	208	273	1,081	8,394	1.54
8	5,475	8,971	427	541	2,706	12,645	2.32
9	5,597	9,541	628	1,280	4,756	16,205	2.90
10	5,296	10,517	1,138	1,375	6,149	19,179	3.62
11	5,468	12,316	1,906	1,603	8,309	24,134	4.42
12	5,088	14,629	2,406	1,944	9,924	28,903	5.68
13	4,981	17,158	3,252	2,084	12,895	35,389	7.11
14	4,851	18,410	4,211	2,267	14,450	39,338	8.12
15	4,337	16,555	4,377	2,401	16,330	39,663	9.17
16	3,422	12,245	3,469	1,438	16,563	33,715	9.86
17	2,266	7,444	2,905	976	12,369	23,694	10.45
18	475	1,704	713	238	2,452	5,107	10.76
19	66	184	131	24	378	717	10.86
20	6	11	17	1	35	64	10.67

Any comparisons which can be made between the data obtained from the two surveys are, in effect, independent in nature, since the children who were examined in the earlier study could not have been included in the 1944-1946 comparison (they would have been at least 16 years old in 1944). These data, therefore, compare two groups, differing only in being exposed to environmental factors which have been changing during the ten years since the first survey was made.

Results

The data obtained from the surveys in 1944-1946 on the observable caries experience of deciduous teeth are presented in Table 1, and the information on the caries experience of the permanent teeth appears in Table 2. The def teeth per child and the DMF teeth per child have been computed according to chronologic age (Fig. 1).

The points representing the DMF teeth per child at each year of age have been smoothed by a straight line (calculated by the method of least squares), since it has been demonstrated that the caries experience of permanent teeth increases approximately in a linear manner for the ages included in this study.[11, 12] The slope of this line is 0.9, indicating a yearly incidence of 0.9 DMF teeth per child. Although the DMF values for each year of age are close to the fitted straight line, actually the points twist around this line.

The incremental values at each year of age are not always constant for our observed average DMF values. The increment is diminished at 8 years of age and is maintained from 9 to 11 years. From 11 to 13 years, the increment is increased, again maintaining this value until about age 16, after which a marked decrease is noted. These incremental changes may possibly be explained by clinical observations, that is, a sudden increase in caries activity in early adolescence as a result of involvement of the newly erupted permanent posterior teeth

11. Knutson, J. W., An Index of the Prevalence of Dental Caries in School Children. *Pub. Health Rep.* 59:233 (February 25) 1944.
12. Klein, Henry, and Palmer, C. E., On the Epidemiology of Dental Caries, in *Dental Caries.* Philadelphia: University of Pennsylvania Press, 1941.

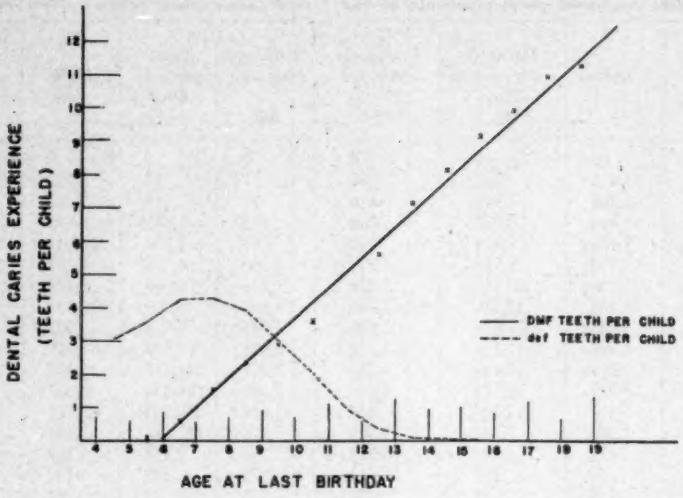

Fig. 1.—Dental caries experience of 61,612 New Jersey school children in 1944-1946

and the proximal surfaces of the anterior teeth may account for the increased incremental values from 11 to 13 years of age.

When these data were analyzed, it was thought advisable to compare them with the information obtained from the surveys performed in 1933-1934. Although the data from the earlier survey do not correspond exactly in nomenclature with those obtained in 1944-1946, the data in both surveys were so recorded that we were able to make comparisons by grouping various ages and by expressing the caries experience in terms of individual children. These comparisons appear in Table 3. In Figure 2 the values for each survey have been smoothed by the use of linear trend lines derived by inspection. The slope of the trend of dental caries experience in 1933-1934 is 0.64, an annual increment of 0.64 DMF teeth per child. For the 1944-1946 data, the slope is 0.91, an annual increment of 0.91 DMF teeth per child. Therefore, the caries experience of permanent teeth (in

Table 3.—Comparison of dental caries experience of New Jersey school children in 1933-1934 and 1944-1946

Age at last birthday, years	Examination period	Children	Deciduous teeth per child				Permanent teeth per child					de DMr teeth per child
			d	e	f	def	D	Mp	Mr	F	DMF	
6–8	1933–34	82,713	1.92	1.38	0.31	3.61	1.13	0.02	0.06	0.16	1.37	4.49
	1944–46	16,281	2.21	1.30	0.63	4.14	1.15	0.04	0.05	0.25	1.49	4.71
9–11	1933–34	96,928	0.61	0.98	0.20	1.79	2.03	0.21	0.28	0.70	3.22	3.90
	1944–46	16,361	0.80	0.84	0.34	1.98	1.98	0.22	0.26	1.17	3.63	3.88
12–14	1933–34	79,666	0.07	0.22	0.03	0.32	3.00	0.51	0.51	1.16	5.18	3.80
	1944–46	14,920	0.06	0.13	0.03	0.22	3.37	0.66	0.42	2.51	6.96	3.98

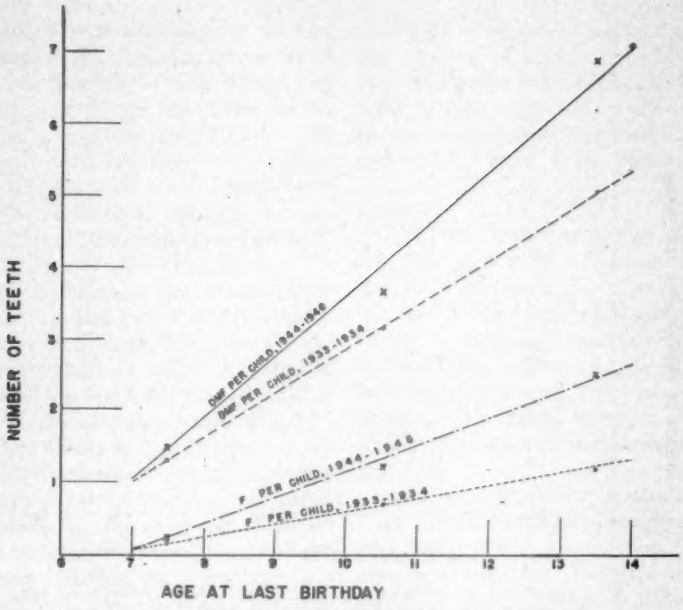

Fig. 2.—Comparison of dental caries experience and permanent fillings in 259,307 school children in 1933-1934 and 47,562 school children in 1944-1946 in New Jersey

the age groups herein considered) appears to have increased in the ten year period since 1934.

Discussion

Although many studies have been published which depict the DMF rate at various chronologic ages in different communities, the number of children examined have comprised samples which are much smaller than the 60,000 examined in New Jersey during 1944-1946. Since the estimated number of New Jersey children from 5 to 19 years of age is about 1,000,000,[13] our survey constitutes a 6 per cent sample of the child population of the entire state.

After the data from the survey in 1944-1946 had been compiled and analyzed, it was thought that a comparison between these results and those obtained from the survey in 1933-1934 would prove interesting. Since one of us (J.M.W.) had supervised both surveys and since both had been conducted in such a way that the data appeared to be reliable,[14] an adequate comparison could be undertaken.

In addition to the differences in the size of the samples in the two surveys, two other dissimilarities exist. In the 1944-1946 survey, each tooth examined was listed in only one category, that is, decayed and requiring filling (D), decayed and requiring extraction (Mr) or satisfactorily filled (F). In the 1933-1934 survey a tooth which presented a filling and also additional evidence of decay was listed as both D and F. Therefore,

13. Characteristics of the Population, New Jersey in *16th Census of the United States, 1940, Population*, Washington, D. C.: Government Printing Office, Second Series, 1942.

14. Cady, F. C., An Analysis of Two Nation-Wide Dental Surveys. *J.A.D.A. & D. Cosmos* 24:1879 (November) 1937.

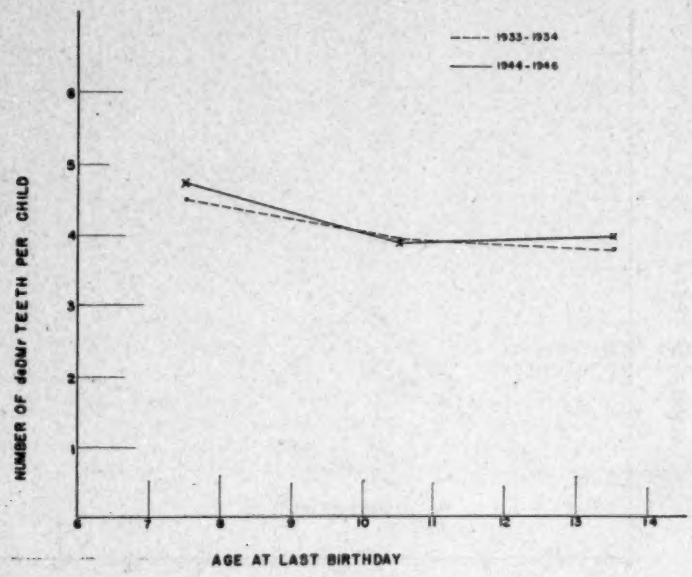

Fig. 3.—Comparison of dental needs of 259,307 school children in 1933-1934 and 47,562 school children in 1944-1946 in New Jersey

the earlier study, according to the 1944-1946 classification, is biased to some extent in the direction of recording a higher DMF rate than actually existed. The comparison is thus conservative.

It must be noted that in 1933-1934, the largest proportion of children examined lived in urban areas, and in 1944-1946 the children lived to a large extent in rural and suburban areas.

Since it has been suggested that the tendency to suffer from dental caries does not differ markedly with respect to economic status,[15-17] we have not tried to interpret the effects of changing economic conditions in the state on the caries prevalence rates.

The examiners in both surveys used mouth mirrors and explorers and recorded pit and fissure cavities. Roentgenograms were not used in either survey.[3] It would seem that discrepancies in precise methods of diagnosis employed by each examiner are relatively unimportant when considered in the light of the large number of children examined in each survey.

From Table 3 it readily can be seen that the number of DMF teeth per child has increased in the past ten years. Since DMF teeth are cumulative, the caries experience increases as the chronologic age increases. The rate of increase has changed from 0.64 new DMF teeth per child per year of age to 0.91 new DMF teeth per child per year of age. Of the various components which go to make up the DMF rate, the only one which is consistently and appreciably greater in the later survey is the number of fillings per child (F/child). Figure 2 shows the fillings per child found in 1933-1934 and

15. Greenwald, R. C., Effect of Social and Economic Status Upon Dental Caries. *J.A.D.A.* 26:665 (April) 1939.

16. Franzen, R., Influence of Social and Economic Factors on the Health of the School Child, in *School Health Research Monographs, No. IV.* New York: American Child Health Association.

17. Klein, Henry, and Palmer, C. E., Community Economic Status and the Dental Problem of School Children. *Pub. Health Rep.* 55:187 (February) 1940.

in 1944-1946, with linear trends derived by inspection. The slope of these trend lines or the number of new fillings per child per year of age was found to be 0.17 in 1933-1934 and 0.39 in 1944-1946. In other words, on the average, more than twice the number of fillings were placed for each child per year of age during the past ten years than had been placed during the preceding years.

When we measure the dental needs per child (the number of deciduous and permanent teeth requiring filling or extraction per child, or deDMr/child), we find that there has been no appreciable change in the past ten years (Fig. 3). Since more fillings have been inserted per child, the conclusion is reached that the increased amount of protective dentistry for children in this state has done no more than keep the dental needs at the same level and that no appreciable improvement has been made in alleviation of dental caries.

Since 1939, the Division of Dental Health of the New Jersey State Department of Health has conducted, in conjunction with the New Jersey Society for the Promotion of Dentistry for Children, the New Jersey Dental Society and state and local dental health committees, an intensive campaign for more and better dentistry for children. Undoubtedly these efforts have helped to increase the average number of fillings per child; however, the average dental needs per child have remained approximately the same because apparently the dental caries experience has been on the increase.

Conclusions

From the evidence herein presented, we can give further factual basis to the statement that dental care, as distributed in New Jersey, has not been sufficient to alleviate the caries problem. Susceptibility to dental caries appears to be increasing among New Jersey school children. Therefore, research efforts to obtain preventive measures should be intensified.

Until such preventive measures are at hand, more dental care designed to correct early dental caries should be encouraged, both for private practice and public health programs. Intensive demonstration treatment programs, based on the concept of complete treatment of members of the younger age groups and subsequent treatment of the incremental defects, have definitely been shown to be effective in the control of the ravages of dental caries.[18]—*Broad Street Bank Building.*

18. *Annual Report, 1946.* Trenton, N. J.: Division of Dental Health, New Jersey State Department of Health.

Length of Life in Early Greece.—A very gradual increase in longevity during early civilization is suggested in a study by J. L. Angel of a series of Greek skulls which cover a long period of time. The increasing average age at death, as indicated in this survey, may well be related to advances in living conditions and in nutrition which are indicated by clues in archaeological findings. In addition, the emergence of medical skills early in Greek history undoubtedly contributed to the advance in longevity over that of prehistoric times.—*"Longevity From Ancient to Modern Times," Statistical Bulletin, Metropolitan Life Insurance Company, October 1947.*

HEALING OF EXTRACTION WOUNDS AFTER USE OF PENICILLIN AND SULFATHIAZOLE: COMPARATIVE CLINICAL STUDY

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THE evaluation of the effects of drugs, which are applied in the sockets or in the mouth, on the healing of wounds after extraction of teeth is a difficult problem. The reaction of the patient to the operation and of the tissues to the trauma incident to the operation varies so greatly that any clinical study must necessarily be somewhat inaccurate. Other factors such as the age and condition of health of the patient, the condition of the tissue and bone surrounding the tooth, as well as the type of organism predominating in the mouth at the time of the extraction, undoubtedly play a part in the process of healing. Unfortunately, accurate methods of measuring the effect on healing of each of these factors are not available.

Claflin[1] found in his work on the healing of extraction wounds in dogs that "the formation of a blood clot was the beginning of tissue regeneration in undisturbed healing of extraction wounds in dogs." Most of us feel that the proper healing of a wound in the mouth begins with the preservation of a healthy blood clot. Whether or not final healing progresses at about the same rate regardless of the presence or absence of the blood clot, the fact remains that the patient is much more comfortable and the healing progresses much more uneventfully when the blood clot stays in place the normal length of time. Empty, dry or septic sockets are the cause of most of the prolonged postoperative discomfort and require many more than the normal number of visits to the dentist. It is, therefore, our constant aim to reduce the number of these unfortunate sequelae.

Most operators agree that wherever possible saliva should be excluded from the socket during the operation and afterwards until a clot has formed. Most operators have given up the practice of washing sockets with a solution after the extraction of the tooth. Many protect the socket for a few minutes with a petrolatum-impregnated gauze pack pressed over the wound. In our experience, this practice seems to be of clinical value.

With the introduction of the sulfonamides and their use in tooth sockets in the form of powder, it was felt that a definite step forward had been made. Sinclair[2,3] and others who used sulfanilamide in treatment of a large series of patients felt that healing definitely was hastened. One of us[4] used sulfathiazole in a like manner and found the results even better clinically than with sulfanilamide. The only explanation of this was that sulfathiazole had more effect than

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1. Claflin, R. S., Healing of Disturbed and Undisturbed Extraction Wounds. *J.A.D.A.* 23:945 (June) 1936.

2. Sinclair, J. A., A Preliminary Report on the Local Use of Sulfanilamide in the Treatment of Oral Lesions. *J. Canad. D. A.* 1:571, 1937.

3. Sinclair, J. A., Sulfanilamide in Dentistry. *D. Survey* 14:935 (August) 1938.

4. Gwinn, C. D., Sulfathiazole in Healing of Extraction Wounds. *J. California D. A.* 17:83 (May-June) 1941.

sulfanilamide on many of the organisms found in and around tooth sockets.

The introduction of penicillin led to an investigation of its local and general effects in treatment of persons with infections of the mouth. MacGregor and Long[5,6] used pastilles of gelatin containing various amounts of penicillin for prevention and cure of infections arising from extractions, fractures and Vincent's infection. Their results were so gratifying that some of their findings were checked by Wright and Rule,[7] Gwinn, Grimm and co-workers[8] and others. MacGregor and Long used lozenges containing 500 and 1,000 Oxford units each of sodium or calcium penicillin; these were allowed to dissolve in the mouth during the daytime. Good results were obtained, and most of the cases of Vincent's infection cleared up within four or five days. Wright and Rule[9] reported a number of disturbances after the use of penicillin lozenges. None of these was of a serious nature, and all cleared up rapidly on discontinuance of the penicillin.

We had used the penicillin lozenges after extraction in a few cases. Healing seemed to progress favorably but the number of cases was so small that we decided to extend the work in an effort to find out whether any real benefit could be expected from their use.

Since the original work of one of us,[4] we routinely have been using a small amount of sulfathiazole powder after extractions, dusting it into the wound especially around the margins. Clinical observation has led us to believe that this procedure has resulted in better healing and fewer dry or septic sockets. It was decided, therefore, to include this type of treatment in our comparative series.

Four Groups

The patients were divided into four groups according to the type of postoperative treatment they received. The patients in Group 1 received twelve lozenges containing 1,000 Oxford units of calcium penicillin each. These were used in the daytime only, beginning about two hours after the extraction and continuing until the supply was exhausted. The patient was instructed to place the tablet in the buccal fold, preferably in the upper fold, and allow it to dissolve, replacing it with a fresh lozenge when it was dissolved. The treatment was not started until two hours after the extraction because it was thought that the placing of the first lozenge might stimulate the flow of saliva which, with increased swallowing or spitting, might in turn disturb the proper formation of the blood clot.

The patients in Group 2 received a routine dusting of sulfathiazole powder in the sockets. This powder was used as supplied by the manufacturer and was not sterilized. No penicillin lozenges were used.

The patients in Group 3 received both sulfathiazole powder in the sockets and twelve lozenges containing 1,000 units of calcium penicillin each.

The patients in Group 4 received no sulfathiazole powder or penicillin.

In all four groups a square sponge of petrolatum-impregnated gauze was pressed over the socket and held in place for three to five minutes by having the patient close upon it. Sockets of impacted lower third molars in all groups were packed with iodoform gauze. In Groups 2 and 3 the gauze was lubricated with 5 per cent sulfathiazole ointment.[10] In Groups

5. MacGregor, A. B., and Long, D. A., The Use of Penicillin Pastilles in Oral Infections. *Brit. M. J.* 2:686 (November 25) 1944.

6. MacGregor, A. B., and Long, D. A., Penicillin Pastilles in the Treatment of Acute Ulcerative Gingivo-Stomatitis (Vincent's Type). *Brit. D. J.* 78:33 (January 19) 1945.

7. Wright, R. B., and Rule, R. W., Jr., Penicillin Lozenges. *J. California D. A.* 21:177 (November-December) 1945.

8. Gwinn, C. D., and others, Administration of Penicillin. *J. California D. A.* 21:182 (November-December) 1945.

9. Wright, R. B., and Rule, R. W., Jr., Penicillin Lozenges. *J. California D. A.* 22:7 (January-February) 1946.

10. The sulfathiazole ointment is marketed by Abbott Laboratories, North Chicago, and consists of sulfathiazole 5 per cent in a water absorbent ointment base. This base, according to Abbott Laboratories, is known as "hydrosorb" and is a mixture of the oleic acid ester and amide of diethanolamine in white petrolatum (U.S.P.).

1 and 4 benzocaine ointment was used to lubricate the gauze.[11]

The teeth selected for extraction were of the types that usually give the most trouble postoperatively; namely, impacted lower third molars and other lower molars, including third molars in cases in which buccal plate removal was necessary. A few impacted upper third molars also were included.

Patients who had had impacted teeth removed were seen on the third day after the operation. Patients who had had other teeth extracted were seen two days postoperatively. The results of the treatment were judged at this time, and no further notations were made unless infection or a septic socket developed later. The results were judged according to the amount of swelling, stiffness of the jaw, evidence of infection or dry or septic socket. Pain was judged by the general response of the patient and as a result of questioning.

In all cases the operation was performed with the patient under local anesthesia. In most of the cases the treatment consisted of a single extraction. In a few cases two or three teeth were removed.

11. The benzocaine ointment used is made by the Novocol Chemical Mfg. Co., Inc., Brooklyn, and consists of 20 per cent benzocaine and 2 per cent oil of cloves in a lanolin petrolatum base.

Extractions followed by penicillin and sulfathiazole

Symptoms	Lower third molar impacted. Packing				Lower third molars not impacted. Buccal plate removed. No packing				Lower molars. Buccal plate removed				Lower molars. Acute infection				Upper third molars impacted				Total				Grand total
	Groups*				Groups				Groups				Groups				Groups				Groups				
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
Cases	47	45	86	30	4	25	27	3	15	37	11	20			6		3	6	6	2	69	113	136	55	373
Swelling																									
None apparent	4	11	28	2	2	15	17	0	4	15	7	6			5		1	2	1	0	11	43	58	8	120
Slight	21	14	39	7	1	3	7	1	8	12	2	4			1		1	3	4	0	31	32	53	12	128
Moderate	16	16	14	14	1	7	3	2	3	8	1	9			0		0	0	1	1	20	31	19	26	96
Excessive	6	4	5	7	0	0	0	0	0	2	1	1			0		1	1	0	1	7	7	6	9	29
Pain																									
Complained of none	20	11	33	6	3	8	8	0	7	6	7	4			5		2	0	1	0	32	25	54	10	121
Slight	18	12	36	6	0	11	10	2	6	18	1	4	Incomplete	Incomplete	1	Incomplete	1	3	4	1	25	44	52	13	134
Moderate	8	15	15	12	0	6	4	1	1	11	1	9			0		0	3	0	1	9	35	20	23	87
Excessive	1	7	2	6	1	0	5	0	1	2	2	3			0		0	0	1	0	3	9	10	9	31
Stiffness of jaw																									
Not apparent	12	33	55	6	3	24	24	1	12	36	11	11			6		3	4	5	1	30	97	101	19	247
Slight	32	11	28	15	1	1	3	2	3	1	0	9			0		0	2	1	1	36	15	32	27	110
Marked	3	1	3	9	0	0	0	0	0	0	0	0			0		0	0	0	0	3	1	3	9	16
Evidence of infection	0	0	0	0	0	0	0	0	0	0	0	0			0		0	0	0	0	0	0	0	0	0
Dry or septic sockets	0	0	0	3	0	4	3	0	0	4	2	1			0		0	0	0	0	0	8	5	4	17

*Group 1, penicillin (no sulfathiazole); Group 2, sulfathiazole (no penicillin); Group 3, sulfathiazole and penicillin; Group 4, no penicillin or sulfathiazole.

These were recorded as 1 case.

The table shows the results of the various treatments, with a recapitulation of the results obtained in each of the four groups.

Results

The best results, as shown by the table, apparently were obtained when both sulfathiazole and penicillin were used. Sulfathiazole without penicillin seemed to give better results than penicillin without sulfathiazole. Sulfathiazole and penicillin used separately or together gave better results than when neither was used.

The results do not indicate that lozenges containing 1,000 Oxford units each of penicillin should be used routinely in the mouth after extraction. Further work with other concentrations of penicillin might bring different conclusions. Owing to the ease with which sulfathiazole powder may be dusted in the wound and its low cost, this drug would seem to be of definite value in this work. In cases in which there is any history of Vincent's infection or in which, owing to the condition of the oral mucosa, the possibility of infection is thought to be increased, the use of penicillin lozenges in addition to sulfathiazole powder would seem to be indicated.

In using sulfathiazole powder several points should be remembered. Use small amounts only. Use it principally around the margins of the wound where there is blood. Since sulfathiazole powder has a tendency to cake and may act as a foreign body, do not allow large lumps of it to drop into the depths of the socket.

One patient became nauseated after using some of the penicillin lozenges, and they were discontinued. There were no evidences of irritation of the mouth or tongue in any of the cases.

Summary

Three hundred seventy-three patients who had had certain types of extractions performed and had been treated postoperatively by four different methods were examined. The results thus far seem to indicate slightly better healing after use of both sulfathiazole powder and penicillin. The routine use of penicillin lozenges after ordinary extractions is not recommended at this time. There have been no local disturbances in our series of cases that would contraindicate the use of penicillin.

Considerations in Nomenclature.—Nomenclature is a field in which there is special need to bear in mind the over-all problem and the good of all. There is some tendency among scientists to be sturdy individualists in nomenclature used. It is natural that the specialist should develop and use names conveniently brief and adequate within his special field, but such names often lack enough clearness and precision for general use.

In the future, chemical nomenclature workers should bear in mind possible relationship with such modern developments as punched cards and ciphers, in addition to indexes and compendia. —*E. J. Crane, "Chemical Nomenclature," Chemical and Engineering News 26:158, January 19, 1948.*

RELATIVE IMPORTANCE OF POLYSACCHARIDES, DISACCHARIDES AND MONOSACCHARIDES IN THE PRODUCTION OF CARIES

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THE topic which I have been asked to discuss suggests that some kinds of carbohydrate in foods may be important in the etiology of dental caries, and other forms of carbohydrates may not be so important. If this is true it might have some practical significance in the control of caries. Thus while it appears economically essential in our present civilization to furnish a large part of our caloric requirements with predominately carbohydrate foods, nevertheless the actual selection of the particular kinds of carbohydrate foods which people consume is open to a considerable degree of educational influence.

There are many kinds of evidence bearing on our subject. These may be classified into (1) studies on caries rates in humans in which the different types of carbohydrate foods in diets have been variously estimated, measured or (in a few cases) controlled; (2) studies of experimental caries in animals in which diets with a more or less clearly defined carbohydrate content have been compared, and (3) bacteriologic and biochemical studies in which the enzymatic activities of oral micro-organisms and saliva on different carbohydrates has been directly or indirectly related to the caries process. In this paper, I have not attempted to cover the literature which has accumulated on these subjects, but rather have selected a limited number of references which seem to me to be representative of our knowledge of the subject.

From a historical standpoint, numerous references have been made to the influence of the eating of sweets in producing decay of teeth, since the time of Aristotle.[1] W. D. Miller[2] cited observations of unusually severe dental caries in confectioners, pastry bakers and other individuals who presumably have consumed an unusual quantity of sugar (sucrose) as indicative of a significant relationship between this food and caries. During the past one hundred years there have been many observations that caries is much less extensive among "primitive" peoples who have not been in contact with modern "civilization," than among those people who have. This difference has frequently been attributed to the extensive use of refined sugar and white flour in modern civilization. For example, Waugh[3] after studies of the teeth and diets of Eskimos in Labrador and Alaska, claimed that caries occurred practically only in people who had consumed foods made of imported sugar and white flour. Waugh expressed the opinion that "foods containing flour alone do not

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1. Aristotle, "Problemata." From the Review of Immanual Bekker, Oxford edition, 1837. Problem 22, Section 14, p. 186.

2. Miller, W. D., *Micro-Organisms of the Human Mouth*. Philadelphia: S. S. White Dental Manufacturing Co., 1890.

3. Waugh, L. M., in *Dental Caries*, second ed. Chicago: American Dental Association, 1941, p. 231.

cause caries in the absence of refined sweets." Osborn Noriskin and Staz[4] in studies of natives in Africa, observed that caries was much greater in people who consumed foods made of refined sugar and flour, than in people who ate native unrefined cereals, and in some cases unrefined sugar cane. They interpreted their data to indicate that some protective factor against dental caries was removed during the refining process, rather than to indicate an inevitable effect of sugar cane and cereals in producing caries.

Toverud[5] has studied the caries rates of children in Scandinavian countries in relation to the recent war, and observed that the caries rate was much lower during the wartime period than in peacetime. He suggested that one of the factors which was responsible for the reduced caries rate was the severe restrictions on the consumption of sugar and sweets imposed by rationing during the wartime period.

Bunting and Jay[6] have studied caries and the occurrence of lactobacilli in the saliva of children who were on diets in which the carbohydrate content was in some cases restricted and in other cases not. They have concluded that caries activity was related to excessive consumption of carbohydrates in general, and sugar or candy in particular, but not to the nutritional adequacy of the diets. On the other hand, Boyd[7] in studies of diabetic children for whom restricted diets were prescribed, has observed an apparent arrest of caries. He has maintained that the arrest of caries was not a reflection of a restricted sugar intake, but rather an expression of a well balanced diet.

The preponderance of evidence seems to support the view that people who consume a relatively high or unrestricted amount of refined carbohydrate foods, and cane sugar (sucrose) in particular, frequently have a relatively high rate of dental caries. Nevertheless, the fact that the influence of factors other than carbohydrates have not been ruled out in studies on humans, plus the fact that sugar and starch have generally been consumed together or intermittently, has made it extremely difficult to establish the relative influence of different carbohydrates in human caries. Much more accurate measurements and extensive data will be needed than are available at the present time.

Caries in Experimental Animals

Another approach to the subject is through experimental caries in animals. For some reason or reasons, most animals do not develop caries in anything approaching the frequency of caries in man, but rats, hamsters and monkeys have been observed to be susceptible to a sufficient amount of experimentally produced caries to be suitable for study purposes. The results of studies on white rats by McClure[8] indicate that on "synthetic" diets, caries was produced with excessive quantities of sucrose and dextrose but not with starch. Schweigert and co-workers[9] similarly found that cotton rats showed a high index of dental caries on diets containing large proportions of sucrose, dextrose and lactose, or dextri-maltose, but a relatively low index of dental caries on starch or dextrin. Anderson and his co-workers[10] have reported that the addition of milk to a

4. Osborn, T. W. B., and Noriskin, J. N., The Relation Between Diet and Caries in the South African Bantu. *J. D. Res.* 16:431 (October) 1937.

5. Toverud, G., Grunnlaget for et Kariesprofylaktisk Arbejd idag. *Odontologisk Tidskrift* 3:277, 1946.

6. Bunting, R. W., and Jay, Philip, in *Dental Caries*, second ed. Chicago: American Dental Association, 1941, p. 76.

7. Boyd, J. D., Nutrition as it Affects Tooth Decay. *J. Am. Dietet. A.* 18:211 (April) 1942.

8. McClure, F. J., Observations on Induced Caries in Rats. V. Effects of Excessive Sugar in the Diet. *J. D. Res.* 24:239 (October) 1945.

9. Schweigert, B. S., and others, Dental Caries in the Cotton Rat. III. Effect of Different Dietary Carbohydrates on the Incidence and Extent of Dental Caries. *J. Nutrition* 29:405 (June) 1945.

10. Anderson, E. P., and others, Dental Caries in the Cotton Rat. IX. Effect of Milk Rations. *Proc. Soc. Exper. Biol. & Med.* 66:67 (October) 1947.

caries-producing diet lessened the caries-producing effect. They suggested that the lactose in milk probably produces less caries than other common sugars, although this was not the only possible explanation of the result.

Keyes,[11] in experiments with Syrian hamsters on different diets, found that:

1. A whole corn diet which gave poor growth and was apparently somewhat deficient from a nutritional standpoint, produced almost no caries.

2. A Hoppert-Weber-Canniff diet (60 per cent cornmeal, 30 per cent whole milk, 6 per cent linseed meal, 3 per cent alfalfa meal, and 1 per cent sodium chloride) gave good growth and produced a considerable amount of caries.

3. A Hoppert-Weber-Canniff diet plus one-third confectioner's sugar, gave almost as good a growth as the Hoppert-Weber-Canniff diet alone, and produced a high amount of caries.

In all of these experiments there has been a considerable variation of caries rates among different animals on the same diet and among different litters of rats and hamsters which suggests that as yet undefined factors are very important in experimental caries in these animals. Nevertheless the results in general indicate that the common sugars, with the possible exception of lactose, are conducive to high rates of dental caries, whereas polysaccharides as the sole carbohydrate content of a diet are conducive to only a moderate or very low incidence of caries.

Bacteriologic and Biochemical Studies

Evidence concerning the relative effects of various carbohydrate substrates on the ability of oral micro-organisms to attack tooth substance may be divided into the following categories:

1. Studies of decalcification of tooth substance and acid production by oral micro-organisms in saliva *in vitro*.

2. Fermentation and pH studies on pure cultures of oral and related types of micro-organisms.

3. Lactic acid production by dental plaque material and mixed saliva.

4. Studies of the pH of dental plaques and carious lesions *in vitro* and *in situ*.

5. *In vitro* studies of the ability of pure and mixed cultures of oral micro-organisms to produce decalcification under chemically defined conditions.

Decalcification by Saliva in Vitro.—W. D. Miller[12] observed that mixed saliva was capable of producing decalcification of sterilized sections of intact teeth when either cane sugar or white bread was added to it, under aseptic conditions, and incubated for one to three weeks. No decalcification occurred when meats or fats alone were added. He also found that acid was produced in saliva in almost equal amounts when comparable proportions of cane sugar or cooked starchy foods (starch, bread, potato, rice, macaroni, corn) were added to it and incubated, but under the same circumstances little or no acid was produced from raw starchy foods, such as raw potato.

Miller observed that pure cultures of micro-organisms isolated from carious lesions produced little or no acid from cooked starch, but suggested that since ptyalin was always present in saliva to convert starch to maltose this would not preclude acid formation and decalcification of teeth from cooked starch in the mouth.

H. P. Pickerill[13] observed that acid production from carbohydrate foods incubated with saliva could not be differentiated on the basis of starch or sugar contents. Chocolate and pastry gave a relatively high acid production and cane

11. Keyes, P. H., Dental Caries in the Syrian Hamster. II. A Preliminary Study of the Effect of Three Different Rations on Caries Activity. *J. Nutrition* 32: 525 (November) 1946.

12. Miller, W. D., American System of Dentistry. Philadelphia: W. Litch and Company, 1886, p. 798.

13. Pickerell, H. P., *The Prevention of Dental Caries and Oral Sepsis*, third ed. London: Bailliere, Tindall & Cox, 1923.

sugar alone gave a relatively low acid production.

Hansen, Fosdick and Epple[14] observed that certain combinations of micro-organisms produced acid when inoculated into mixtures of polysaccharides and sterilized saliva.

Osborn, Noriskin and Staz[15] reported experiments on decalcification of sections of intact teeth by saliva and carbohydrate mixtures. They concluded that decalcification was greater when refined sugar and wheat meal were used than when unrefined sugar cane juice or whole wheat meal were used, and postulated that these differences were due to the removal of calcium and phosphate during the refining process. This difference correlated with a greatly increased rate of caries in natives living on refined sugar and wheat meal, as compared with natives who ate unrefined cereals and unrefined sugar cane.

Volker and Pinkerton[16] reported that comparable amounts of acid were produced in mixtures of the unstimulated saliva of carious people incubated with dextrose, sucrose or starch, and no difference was observed in acid produced with raw or refined sugar cane.

Studies of Pure Cultures.—W. D. Miller[12] observed that pure cultures of most micro-organisms isolated from carious lesions could ferment the common sugars but not starch. Kligler[17] found that of 426 various oral micro-organisms isolated in pure culture, 99.5 per cent fermented dextrose, 70 per cent fermented lactose, 72 per cent fermented sucrose. He concluded that the organisms present in early stages of caries (Bacillus acidophilus, Cladothrix placoides and Leptothrix buccalis) very actively ferment the common sugars to acid, and bring about a comparatively great decalcification of powdered tooth substance.

Harrison and Opal[18] found that of 58 strains of oral lactobacilli, 100 per cent formed acid from milk, 100 per cent fermented dextrose, 97 per cent fermented levulose, 95 per cent fermented galactose, 93 per cent fermented sucrose, but only 21 per cent fermented dextrin.

Stephan and Hemmens[19] found that rapid pH changes were produced by several kinds of oral micro-organisms at high cell concentrations, from the monosaccharides dextrose and fructose. Sucrose and maltose in general gave slightly slower pH changes and lactose considerably slower, whereas pH changes from soluble starch were either very slow or were not produced at all.

It is of interest to note that Camien, Dunn and Salle,[20] in a study of the effect of carbohydrates on acid production by twenty-four lactic acid bacteria (not of oral origin), found that 23 strains gave approximately maximum acid production from glucose, 21 strains from fructose, 19 strains from maltose, 12 from sucrose, 7 from lactose and none from dextrin. Starch was not tested, but presumably would not give appreciable acid just as in the case of dextrin.

It seems clear from these studies that with most acidogenic oral micro-organisms and related types, fermentation takes place and acid is produced very frequently from the common monosaccharides dextrose and fructose, fairly frequently from the disaccharides sucrose and maltose, less frequently from the disaccharide lactose, and seldom from the polysaccharides dextrin and starch.

14. Hansen, H. L.; Fosdick, L. S., and Epple, C. F., The Action of Mouth Organisms on Certain Carbohydrates. *J.A.D.A.* 24:1611 (October) 1937.
15. Osborn, T. W. B.; Noriskin, J. N., and Staz, J. A., A Comparison of Crude and Refined Sugar and Cereals in Their Ability to Produce in Vitro Decalcification of Teeth. *J. D. Res.* 16:165 (June) 1937.
16. Volker, J. F., and Pinkerton, D. M., Acid Production in Saliva-Carbohydrate Mixtures, *J. D. Res.* 26:229 (June) 1947.
17. Kligler, I. J., A Biochemical Study and Differentiation of Oral Bacteria With Special Reference to Dental Caries. *J. Allied D. Soc.* 10:282 (September) 1915.
18. Harrison, R. W., and Opal, Z. Z., Comparative Studies on Lactobacilli Isolated From the Mouth and Intestine. *J. D. Res.* 23:1 (February) 1944.
19. Stephan, R. M., and Hemmens, E. S., Studies of Changes in pH Produced by Pure Cultures of Oral Micro-Organisms. *J. D. Res.* 26:15 (February) 1947.
20. Camien, M. N.; Dunn, M. S., and Salle, A. J., The Effect of Carbohydrates on Acid Production by Twenty-four Lactic Acid Bacteria. *J. Biol. Chem.* 168: 33 (April) 1947.

Acid Production by Plaque Material.—Although W. D. Miller as early as 1883 had isolated crystals of what was apparently zinc lactate from both carious dentin and saliva-carbohydrate fermentation mixtures by a method using ether extraction and treatment with zinc oxide, it was only when B. F. Miller and John Muntz[21] developed a specific microchemical method for the quantitative determination of lactic acid that lactic acid could be conclusively demonstrated in carious lesions. Later B. F. Miller, Muntz and Bradel,[22] in a study of lactic acid production from carbohydrates by dental plaque material, found that this acid was readily produced from dextrose, maltose and sucrose by plaque material from both caries-active and caries-free individuals. Lactic acid was produced less readily but still in appreciable quantities from lactose and starch.

Neuwirth and Klosterman,[23] using the Miller-Muntz method, found that lactic acid could be recovered in greatly increased amounts from fresh saliva collected soon after tablets of dextrose, sucrose or starch had been dissolved in the mouth. Considerably less lactic acid was produced from the starch tablets than from the dextrose or sucrose tablets. They ascribed the effect to fermentation by oral micro-organisms.

Measurement of pH in the Mouth.—By use of the antimony electrode for direct pH readings in the mouth, Stephan[24] was able to demonstrate very rapid acid production in plaques from dextrose, fructose, maltose and sucrose. Lactose produced much smaller pH changes, while a cooked starch paste produced pH changes like maltose but more slowly when it was held in the mouth. Evidently the ptyalin in saliva was able to convert this starch into maltose. On the other hand raw potato did not give these rapid pH changes, suggesting that the carbohydrate in this form was not readily available to the micro-organisms in plaques or readily acted upon by the amylase present in saliva. Fosdick[25] found that similar pH changes occurred in material which he removed from the mouth and teeth and tested with a micro-glass electrode.

Activity in Chemically Defined Mediums.—In recent work the author has observed that in a chemically defined medium with suitable factors (other than the carbohydrates) for growth of acidogenic oral micro-organisms, the ability to produce decalcification of calcium salts precipitated in the medium depended on the ability of the micro-organisms to utilize the kind of carbohydrate which was added. Most acidogenic oral micro-organisms could not utilize "soluble" starch directly. The addition of amylase or the simultaneous growth of amylase-secreting micro-organisms (which did not in themselves produce decalcification) generally permitted decalcification to occur. A relatively few strains of the acidogenic micro-organisms studied did not utilize maltose and did not produce decalcification when it was the only carbohydrate present in the medium. However, when they were grown in the presence of some different micro-organisms which did utilize this disaccharide (but which did not alone produce decalcification), then decalcification was produced. These results suggest that, other factors being adequate, the monosaccharides dextrose and fructose are most apt to activate oral micro-organisms to produce caries; the disaccharides sucrose, maltose and lactose are somewhat less apt to activate oral micro-

21. Miller, B. F., and Muntz, J. A., A Method for the Estimation of Ultramicroquantities of Lactic Acid. *J. Biol. Chem.* 126:413 (November) 1938.

22. Miller, B. F.; Muntz, J. A., and Bradel, Sigmund, Decomposition of Carbohydrate Substrates by Dental Plaque Material. *J. D. Res.* 19:473 (October) 1940.

23. Neuwirth, I., and Klosterman, J. A., Demonstration of Rapid Production of Lactic Acid in Oral Cavity. *Proc. Soc. Exper. Biol. & Med.* 45:464 (October) 1940.

24. Stephan, R. M., Changes in Hydrogen-Ion Concentration on Tooth Surfaces and in Carious Lesions. *J.A.D.A.* 27:718 (May) 1940.

25. Fosdick, L. S., and Burrill, D. Y., The Effect of Pure Sugar Solutions on the Hydrogen-Ion Concentration of Carious Lesions. *Fort. Rev. Chicago D. Soc.* 6:7 (December 1) 1943.

organisms to produce caries, and the polysaccharides are least apt to activate oral micro-organisms to produce caries.

Discussion

Although the evidence which has been reviewed can be and has been interpreted in many different ways, nevertheless in general there is a certain amount of agreement. It seems clear that fermentable carbohydrates are essential to the caries process, but do not in themselves produce it. Thus factors other than carbohydrates must in many cases account for observed differences in caries rates and caries activities in both man and experimental animals.

Of the carbohydrates, it seems clear that the readiness with which they are fermented to acids by oral micro-organisms, as well as the frequency and quantity in which they are consumed, largely governs their role in caries production. While the monosaccharides, i.e. dextrose and fructose, usually are more frequently fermented than the disaccharides, i.e. sucrose and maltose, sucrose is generally consumed in larger quantities, and maltose is produced in the mouth from some starchy foods by the action of salivary amylase. Thus there seems to be little reason at present to believe that any of these sugars is an exclusive substrate for the production of caries. Specific enzymatic reactions with sucrose such as have been recently described by Doudoroff[26] have not as yet been shown to be important in the caries process. Lactose appears to be somewhat different from the other common sugars in that it does not give so great an acidity in dental plaques and carious lesions in humans, or apparently produce as severe experimental caries in rats, as do dextrose, fructose, sucrose and maltose.

On the other hand, there seems to be a considerable difference between the caries-producing potentiality of polysaccharides, such as starch, and the monosaccharide or disaccharide sugars. Cornstarch has been found to produce a much lower score for experimental caries in rats than an equivalent amount of the common sugars, and many people who have low caries rates consume diets which have a high proportion of starch. Several explanations are possible. Few oral micro-organisms seem to attack starch directly. While amylase is present in human saliva, this is not necessarily sufficient to convert all starch to maltose in the mouth. Apparently the amylase in saliva is not able to attack many raw starch foods. Finally, the fact that starch lacks the diffusibility of the sugars may prevent it from entering dental plaques and reaching the areas in which caries is produced.

Summary and Conclusions

It is becoming increasingly evident that dental caries is a disease in which several different factors play important roles. Carbohydrates in the diet constitute one of these factors. Of the different kinds of carbohydrates which people commonly consume, the monosaccharide and disaccharide sugars are generally fermentable by acidogenic oral micro-organisms, rapidly lower the pH in plaques and carious lesions, and produce caries in rats and hamsters under suitable experimental conditions.

The polysaccharides starch and dextrin are generally not directly fermentable by acidogenic oral micro-organisms, but may be rendered so by the action of salivary amylase. Starchy foods may lower the pH in plaques and saliva of humans if the starch has been cooked, but generally raw starchy foods do not produce these rapid pH changes. Starchy foods give very low experimental caries scores in rats as compared with sugars.

While as a rule the consumption of

26. Doudoroff, M., On the Utilization and Synthesis of Sucrose and Related Compounds by Some Micro-Organisms. *Federation Proceedings* 4:241 (September) 1945.

relatively large amounts of sugars is apparently conducive to much higher caries rates in humans, nevertheless there is evidence that in some individuals other factors may confer a natural resistance to dental caries. It may be hoped that when these natural resistance factors are better understood and the knowledge of them generally applied, then the relatively large amounts of sugars which people consume today could be eaten without the production of caries.

SURGICAL RESECTION IN THE CONSERVATIVE TREATMENT OF PERIODONTOCLASIA

Arthur H. Merritt, D.D.S., M.S., Sc.D., New York

Periodontoclasia is a disease which has as its chief characteristic the destruction of the alveolar process. This destructive process is not uniform throughout the mouth, nor is it uniform about the individual teeth. It begins at the crest of the alveolar process, painlessly and usually without any subjective symptoms, and progresses slowly toward the apexes of the involved teeth. As the shrinkage of the gingival tissue as a rule does not keep pace with the destruction of the alveolar process, pockets of varying depths are formed. These pockets are prone to occur in those areas of the mouth and about those surfaces of the teeth which, because of relative inaccessibility, receive the least care. Thus, it will be found that pockets are most likely to occur adjacent to the proximal and lingual surfaces of the teeth. There are, of course, exceptions. Frequently the destruction of the alveolar process has advanced to the point where the teeth are loose, but other teeth in the mouth remain unaffected. Again, a pocket may form adjacent to one surface of a root, while other surfaces remain in perfect health. This lack of uniformity in the destruction of the alveolar process leads one to believe that in most cases the chief etiologic factors are located in the mouth.

Subgingival Curettage

The prognosis in all cases corresponds with the depth of the pockets. In cases in which these pockets are only a few millimeters in depth, excellent results may be obtained by subgingival curettage. As the pockets increase in depth, the possibilities of success by this method of treatment are decreased correspondingly.

In the not remote past when most periodontists limited their treatment to subgingival curettage, teeth with deep pockets either were extracted or were treated by curettage in the hope of postponing their loss. Not a few of those dentists employing this form of treatment achieved a large measure of success, and many still are limiting their practice to the so-called conservative method. It has the advantage, when successful, of restoring the mouth to a more nearly normal condition than can be obtained by surgical treatment. However, removal from a surface that cannot be seen of

Fig. 1.—Flap operation showing vertical incisions at each end of operative area

whatever there is on it that needs to be removed always will be an uncertain operation, even in skillful hands.

Surgical Resection

For this reason, more and more of those dentists engaged in the practice of periodontia are turning to surgical resection. Operative treatment of periodontoclasia is not, however, of recent date, since it was employed in Europe as early as 1772 and possibly earlier.[1] As might be expected, the more or less general use of surgical treatment in the practice of periodontia, plus refinement in technic, has taken place in this country. The Robicsek or so-called flap operation was the method most often employed in the early days of periodontal surgery.[2] This consisted of laying back a buccolabial flap (Figs. 1 and 2) and retracting the lingual wall of the pockets, after which the root surfaces were curetted and the flap was brought into place and sutured (Fig. 3). In this way visibility as well as accessibility was obtained. The root surfaces were protected against thermal shock, and disfigurement from receded gums was reduced to a minimum.

Experience, however, proved that this type of periodontal treatment was not always successful. Unless the pocket was obliterated by reattachment, which was usually not the case, there was always the possibility of these pockets becoming reinfected. Moreover, lack of uniformity in the depth of the pockets added to the difficulty. These pockets might be deep adjacent to the proximal or lingual surfaces of the teeth, with few or no pockets on the buccolabial surfaces. For these reasons the flap operation does not have wide application in periodontal surgery. Because of the importance of preservation of the gums in their normal relation to the teeth and the prevention of possible disfigurement, the flap operation appears to be the operation of choice; however, it has come into more or less disfavor in recent years.

Experience has shown that obliteration of pockets which are at all deep is essential to success in the treatment of periodontoclasia. If obliteration could be achieved by reattachment after subgingival curettage, surgical operation would play a less important part, but unfortunately this is not the case. That there are cases in which reattachment occurs would seem clinically to be true, but most dentists will agree, I think, that such cases are the exception rather than the rule. For this and other reasons, in recent years surgical removal of periodontal pockets has come into more general favor.

After the region to be operated on has been anesthetized and the location and depth of the pockets has been determined, a horizontal incision is made along the buccal and lingual surfaces as indicated by the loss of bone (Fig. 4,

Fig. 2.—Retraction of labial flap

1. Prinz, Hermann, *Diseases of the Soft Structures of the Teeth and Their Treatment*. Philadelphia: Lea & Febiger, 1928, p. 342.
2. Berger, Adolph, The Surgical Treatment of Periodontoclasia. *J.A.D.A.* 14:1013 (June) 1927.

Fig. 3.—Flap brought back into place and sutured between each tooth in the operative field

left). This is followed by the removal of all unattached gingival tissue, in this way completely obliterating all pockets. The root surfaces, which are now visible, are planed carefully to remove septic calculous material. After this a surgical cement is applied in such a way as to protect the entire operative region. This cement is packed between the teeth and allowed to remain, with occasional changes, for four or more weeks, depending somewhat on the amount of tissue removed (Fig. 4, right). For this operation it is usually advisable to divide the mouth into six areas, the four molar areas and the two incisor areas. For cosmetic reasons, it is desirable, as far as is possible, to treat the anterior teeth by curettage. As these teeth are more accessible and have only one root each, they are treated more successfully by subgingival curettage than are the molars and bicuspids.

After removal of the pack, root sensitivity if present can be overcome largely by the use of silver nitrate or formaldehyde. Occlusal adjustment and the restoration of missing teeth also should be considered as in all cases of periodontal treatment.

The patient should be instructed carefully in the care of the mouth, including daily massage of the gingival and interdental spaces. The importance of persevering in this treatment cannot be overemphasized. The results are highly satisfactory. In most cases there is relatively little disfigurement, and when surgical removal of pockets is limited to the posterior teeth this need not be a matter of great concern. There is also surprisingly little postoperative pain, much less than is generally believed.

Comment

By the surgical resection of periodontal pockets, many teeth that in the past would have been condemned to extraction can be preserved in health. Surgical resection has the added advantage of requiring less skill than subgingival curettage, consuming less time and being attended by more certain results.—*580 Fifth Avenue.*

Fig. 4.—Left: Horizontal incision for removal of pockets, buccal surface. Right: Surgical pack in place after removal of pockets

USE OF CHEMOTHERAPY IN DENTAL INFECTION

Stephen P. Mallett, D.M.D., Boston

In 1947, for the first time, the Section on Hospital Dental Service sponsored a hospital clinic program as part of the annual session. I hope that similar programs will be included in all future sessions of the Association, because there are always dentists whose chief interest is in infections of the teeth and adjacent structures. These men naturally seek an opportunity to see what other dentists may be doing in actual clinic work, and they are generally more interested in visiting an active clinic with patients than in attending lecture programs which are theoretic in nature. Lectures, with or without slides and motion pictures, are secondhand affairs no matter how well they may be presented.

Staff

At the Boston City Hospital the patients who require chemotherapy may be either ambulatory or hospitalized. At the time of preparation of this paper there were 29 patients in the wards of this hospital who were receiving complete care and treatment by the oral surgery service of the Department of Dentistry. The department is administered by a dentist who is both director of the department and oral surgeon-in-chief. He is also associate professor of exodontia and oral surgery at Tufts College Dental School. The visiting staff and assistant resident also have appointments as instructors at the dental school.

Oral surgeon-in-chief, Boston City Hospital, and associate professor of exodontia and oral surgery, Tufts College Dental School.

The oral surgeon-in-chief receives no salary and has under his supervision twenty-one part time, nonsalaried members of the visiting staff, a salaried assistant resident, two nonsalaried house officers, a graduate nurse, a dental x-ray technician, a dental hygienist, a bookkeeper-secretary and transfer porters. Any member of the visiting or house staffs may prescribe chemotherapy. Ward rounds are made three times a day by the visiting staff, the house staff, or both. Students from Tufts College Dental School observe or work in the clinic, and dental hygienist students from the Forsyth Dental Infirmary also observe in the clinic. There are other teaching associations and lecture programs.

In the care of patients by this group, dental autonomy is both desirable and necessary, even though consultations with other departments frequently are advisable. Needless to say, a complete history is taken and roentgenologic and clinical examinations are made of each patient. After the examination by the visiting and house staffs, a program of treatment is agreed upon.

Prompt Treatment

In the management of patients with compound fractures, alveolar abscesses, Vincent's infection and other conditions about the teeth and jaws, chemotherapy is often the first treatment instituted after examination. When a patient presents a phlegmon of the face of dental origin, roentgenologic and clinical examinations are completed, and before the patient leaves the oral surgery quarters

to go to the admitting room, an adequate dose of penicillin is administered intramuscularly. Within the next hour hospital orders are written for further penicillin injections.

The reason for such prompt treatment is that the sooner the necessary penicillin level in the blood is attained, the sooner the causative factor may be removed.

The Sulfonamides

The first of the sulfonamide group used in this hospital was sulfanilamide. This was followed by sulfathiazole, sulfadiazine and others of the sulfonamide group which were proved by means of clinical and laboratory tests to be of lesser value in the treatment of dental infections. Because of the types of bacteria found in dental infections, the useful group finally simmered down to sulfathiazole and sulfadiazine. The objections to sulfa drugs are, of course, urticaria, the effect of the sulfa drugs on certain blood corpuscles and other side effects. Then came the period of testing from free pus and selecting a drug according to the micro-organism found.

There is no question of the real part the sulfonamides have played because of their bactericidal or bacteriostatic action, depending on the sulfonamide used and the causative bacteria. Resolution of an alveolar abscess was found to be more likely with sulfonamide therapy than without. However, the most important determination was that chemotherapy alone is not sufficient and that the focus of infection must be removed or an incision made and drainage well established, or both, in order for chemotherapy to be of value. The value of hospitalization, with bed rest, was recognized before the sulfonamide drugs were discovered. Hospitalization might include an enema, cathartic, daily bath, alcohol rubs, forced fluids, dehydration treatment, alkalization in case of acidosis, heat therapy, examination for avitaminosis, blood and urine examination and, in selected cases, radiation therapy.

An additional observation, which seems difficult to prove except by clinical experience and results, is that aseptic technic in all operations about the face and jaws is of the greatest importance.

Penicillin

In the early days of treatment with penicillin both it and the sulfonamides were used in practically all cases, but dependence was placed on sulfonamides because the true value of penicillin was not known at that time. Today, if a patient fails to respond to penicillin, operation or elimination of the focus of infection, or to proper hospital care, either the sulfonomides or streptomycin is used in addition, but penicillin is by and large the drug of choice.

The experienced professional person usually can determine the correct amount of penicillin to prescribe by looking at the patient and taking into consideration age, sex, weight and other physical factors. It is better to administer too large rather than too small a dose. Penicillin has been given intramuscularly, intravenously, orally and by local injection around a region of infection. Because intramuscular injection accomplishes everything that the other methods do, either singly or together, it is the method of choice in the treatment of phlegmons of the face and jaws.

Local injection of penicillin around or into abscessed regions requires further discussion. The objections to this method are: 1. Injection is painful without an anesthetic. 2. If a local anesthetic is used, its injection is painful and the anesthetic often proves inadequate or fails entirely. 3. Unless great care is taken, there is danger of carrying bacteria on the needle into noninvolved tissue, thus extending the infection. 4. If pus is present and it is not withdrawn, the injection of penicillin into an already swollen and

overfilled region may cause extension of the infection. 5. An injection into an abscessed region must be supplemented with additional injections, preferably in the buttocks. 6. Since injections into the buttocks are adequate, why inject other regions in addition?

It is indeed dramatic to admit to the hospital a badly infected patient with a temperature of 102 F., a typical swelling and a history of a recent extraction or a tooth indicated for extraction, and on administering 100,000 units of penicillin intramuscularly every three hours, to see the temperature drop to a nearly normal level. A number of our first experiences with penicillin yielded results which were unsatisfactory, mostly because of inadequate dosage.

One of many interesting cases of facial swelling was diagnosed first as mumps and next as parotid tumor. Roentgenograms of the teeth and jaws were negative. The history revealed an extraction of a mandibular second molar two months before onset of the swelling. After five days, dental consultation was requested and roentgenograms revealed an extensive osteomyelitis extending from the mental region of the mandible distally throughout the body of the mandible and the entire ascending ramus. This woman was given 50,000 units of penicillin every three hours for three days, and 100,000 units every three hours for two more days. As response was still poor, the amount was increased to 200,000 units every three hours for the next fifteen days. Complete resolution without the usual sequestration followed this treatment.

The accumulating data indicate that countless acute alveolar abscesses, which before the use of sulfonamides and penicillin would have developed into osteomyelitis or would have required extraoral incisions for drainage, are being resolved without either complication through the use of antibiotics.

All patients with fractures who were admitted and placed on penicillin therapy have experienced fewer abscesses.

For many years before chemotherapy was used, the annual average number of extraoral incisions of alveolar abscesses in this hospital was 40, and intraoral incisions numbered 100 to 115. Last year, when penicillin alone was used, except for 1 patient to whom sulfathiazole also was administered, only 11 extraoral incisions for drainage of alveolar abscesses were necessary. Of course, this reduces the number of patients available for demonstrating technics of extraoral incision, and the future will provide even fewer cases as undiscovered antibiotics come into use. The number of other infectious processes such as mastoiditis, furuncles and so forth have been reduced, and it is expected that dental complications and phlegmonic sequelae will be similarly reduced.

Cardiac Disease

One of the most interesting uses of chemotherapy has been in the treatment of dental patients who have rheumatic heart disease. After the history has been taken and the heart sounds have been determined, penicillin is prescribed. At first, all these patients were hospitalized and given adequate doses of penicillin for one, two or three days before extraction or other required dental work was begun. From 6 to 9 patients a month for the past two years have been treated in this manner with but one fatality, which occurred four days after extraction.

A few patients with less severe cardiac damage resulting from rheumatic fever may be treated as ambulatory cases with an adequate amount of penicillin daily either by intramuscular injection of the drug in beeswax and peanut oil or by the oral route every three hours around the clock. A few hospitalized heart patients with affections such as trismus and extensive swellings have received gas-oxygen after careful stethoscopic exam-

ination and after penicillin therapy, when the administration of a local anesthetic agent would have been impossible or inadequate. In a number of cases, the heart sounds seem improved after penicillin therapy, but this may not be attributable to the penicillin, as bed rest is beneficial in cases of cardiac damage.

Conclusion

In order to realize fully the possibilities of chemotherapy in dentistry, one must (1) obtain a complete history, (2) study complete and satisfactory roentgenograms, (3) make a complete examination, including analysis of blood and urine, (4) reach a correct diagnosis, (5) hospitalize the patient when advisable, (6) utilize chemotherapy, (7) follow aseptic surgical procedure, (8) extract the tooth or incise and drain the affected region, or both, as early as possible and (9) institute proper and adequate postoperative care.—*358 Commonwealth Avenue.*

SCIENTIFIC MANAGEMENT OF FACTORS IN BILATERAL PROSTHETIC OCCLUSION

Victor H. Sears., D.D.S., Salt Lake City

ALTHOUGH much progress has been made in the technics of denture construction, this progress has lagged because dentists in general are not trained physicists. The unfortunate omission from the dental curriculum of adequate courses in physics has made it difficult for dentists to recognize all of the factors involved in denture construction, to see their comparative importance and to discover their relation to one another.

One phase of prosthetic occlusion which has been emphasized out of proportion to its importance is that of three point contact or balanced occlusion. Without intending to minimize its importance, I will show that there are some overlooked mechanical factors more important than protrusive and lateral balance. This discussion will show how recognition of these additional factors enables the dentist to deal confidently with the unusual as well as the average situations in a patient's mouth.

It will help if one bears in mind the fact that in prosthetic occlusion the individual teeth have no significance. We deal rather with units of occlusion or segments of the entire occlusal formation.

No consideration will be given to the sluices or other markings on the occlusal surfaces. Lateral jaw relations also are omitted, because any adequate treatment would expand the discussion too greatly. However, a grasp of the considerations presented will suggest those omitted.

Terms

For purposes of complete understanding, it is necessary to define terms.

Balanced Muscular Tonus.—This condition of muscular balance maintains a part in equilibrium under minimum muscular contraction. Applied to the mandible, this term means that all of the levator muscles are exerting a pull which exactly balances that of gravity plus that of

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all of the depressor muscles under normal tonus. This rest position of the mandible is not independent of posture, because the degree of separation of the jaws and the amount of jaw protrusion under balanced muscular tonus are dependent on the inclination of the patient's head.

Centric Relation.—According to the definition of the National Society of Denture Prosthetists, as published in 1930, "the mandible is in centric relation when the heads of the condyles are in their most retruded positions from which the jaw can make free lateral movement."[1] Centric relation exists at many degrees of jaw separation. It is demonstrated in the needle-point tracing by the intersection of right and left arcs of the right and left centers of rotation. All other relations are, by definition, eccentric relations.

Dentists should not be confused by the fact that they may choose to build dentures at some "functional" or "easy" position with the mandible somewhat advanced from centric relation. I am not concerned in this article with any relation to be selected as the one at which to construct the dentures; I am merely defining centric jaw relation for purposes of clear discussion.

Chewing.—Chewing is the act of applying force to food between opposing occlusal surfaces.

Basal Seat.—The entire tissue area under the denture base, regardless of the supporting value of the tissues thus covered, is the basal seat. It includes covered areas useful in retaining the denture base; some of these areas may be of little or no value in supporting the occlusal load.

Denture Foundation.—This term refers to that portion of the basal seat which gives support to the denture base. In supporting the load of mastication it is the denture foundation which is significant.

Lower Molar Slope.—This term defines that portion of the lower basal seat which turns up at the posterior part to form a forwardly facing incline. The lower molar slope may start abruptly or may turn up gradually. It may be firm along its entire extent or yielding only in its posterior part. In the scheme here proposed, the steepness and consistency of the lower molar slope govern the posterior extension of the occlusal pattern. The steepness of the slope is apparent on the cast, but the consistency of the tissues must be learned by their examination.

Occlusal Plane.—That plane on which the posterior teeth occlude is known as the occlusal plane. This is a loose term because the occlusal surfaces of all teeth seldom lie on the same plane. However, it is sufficiently accurate in some connections and should be retained.

As will become evident, the fixing of the occlusal plane for denture stability should not be established according to such anatomic concepts as Camper's plane or the Frankfurt plane. Nor should it be fixed at all until after the degree of separation of the jaws has been established.

Occlusal Patterns.—These are the two projected or imaginary areas, one right and one left, on which we intend to oppose the occlusal surfaces of the teeth in chewing. The occlusal patterns are ordinarily located just lingual to the lower ridge crest and about midway between the upper and lower ridges. The two may be of different size, form and placement on right and left sides. "Occlusal pattern," a more exact and restrictive designation than "occlusal plane," should be used where greater accuracy is needed, because there is only one occlusal plane but there are two occlusal patterns.

Working Occlusal Surface.—That part of the occlusal surface of the teeth which meets an opposing surface in chewing is the working occlusal surface, the surface which accomplishes the work as the jaws

1. Report by the National Society of Denture Prosthetists. *J.A.D.A.* 17:1123 (June) 1930.

come together. All or part of the occlusal surface of a tooth may constitute its working occlusal surface, and, on right or left side, all of the surfaces of all of the teeth which accomplish work constitute the working occlusal surface of that side. The occlusal pattern is merely an imaginary area to be calculated according to the size, form and consistency of the denture foundations as related to the magnitude and direction of the chewing force and the relative positions of the two foundations. The working occlusal surface is the actual functional surface. When the term "occlusal surface" is used in this discussion, "working occlusal surface" is meant.

Although only the mechanical factors are considered here, it should be borne in mind that esthetic and other considerations will in some cases make the complete application of the mechanical principles inadvisable.

Before the principles are applied, some pertinent facts regarding the forms and relative positions of the structures involved should be reviewed, together with the directions of forces exerted on these structures by the patient.

Approximately the posterior two thirds of the palatal vault faces in a downward direction. The anterior third, the rugae zone, faces somewhat posteriorly.

The lingual and labial walls of the lower alveolar ridge are essentially vertical; the buccal walls as they extend posteriorly become more nearly horizontal.

As viewed from above, the upper alveolar ridge normally lies outside the lower one in its anterior part and inside the lower one in its posterior part. It follows that on right and left sides there is a point at which the upper ridge lies exactly above the lower one. The ridge-crossing point on the right side may have a different anteroposterior relation from the one on the left side. These horizontal relations of the opposing alveolar ridges are important in the management of occlusal surfaces.

Placement of the occlusal surfaces depends on the direction of force exerted on the denture foundations when artificial dentures function as parts of the chewing mechanism. Fortunately for denture stability and for conservation of the supporting structures, the closing force is essentially at right angles to both upper and lower denture foundations, or in most cases can be made to be.

For practical purposes, the crest of the upper alveolar ridge as viewed in profile follows a straight line from the maxillary tuberosity to the cuspid region.

The lower ridge in its posterior part is characterized by an upward slope which cannot be made to lie parallel with the crest of the upper ridge and at right angles to the direction of muscle pull, as demanded by the law of statics, to be stated presently.

One should bear in mind the fact, already mentioned in defining the lower molar slope, that there is often an area at the posterior extremity of the lower basal seat which is of little or no value in supporting the occlusal load. Fortunately, when the occlusal factors are managed scientifically, the posterior extremity of the lower alveolar ridge is usually not so steep nor so yielding as to interfere seriously with contriving the required stability.

With these facts in mind, we are prepared to consider in what ways the orthodox scheme is unsuited to the edentulous situation and to make new applications of the known mechanical principles. Among the mechanical considerations relating to the problem the following three are the most important:

1. For maximum stability, all occlusal and supporting surfaces involved in the act of chewing must be parallel to one another and at right angles to the direction of force. This ideal is not always attainable. In practice, the occlusal plane should be as nearly as possible parallel

with both denture foundations.

2. For greatest support, the load must be applied at the center of the denture foundation, both anteroposteriorly and buccolingually. This ideal can be approached but not actually achieved in practice.

3. For greatest ease of penetration of a bolus, the occlusal area must be reduced to a minimum. Practically, the area of the occlusal surface must be small in extent in order to reduce pressure on the denture foundations to safe limits.

These three simple propositions, based on recognized mechanical principles, indicate how practical applications of these principles can be made.

Inclination of Lower Denture Foundation

The lower denture foundation is made to face the upper one as exactly as possible. Always ensuring that the mandible is not opened beyond its rest position,[2, 3] the operator's first object is the paralleling of the opposing alveolar ridges, beginning at the bottom of the lower molar slope and extending anteriorly to the cuspid region. This first step is a purely laboratory operation and consists of mounting the opposing casts on an articulator by means of a face-bow. If, in the typical case, the opposing ridges are farther apart in the front than in the back, it is necessary only to close the space until the separation is the same at the two ends of the computed portions.

The degree of separation of the jaws arrived at in this manner establishes the starting position from which to make alterations as dictated by factors to be explained presently. The mechanically ideal degree of jaw separation arrived at by paralleling the opposing denture foundations may be altered for esthetic or other considerations. Nevertheless, it remains a mechanical ideal to be found and approached as nearly as the other considerations permit.

If it were only the horizontal portions of the opposing alveolar ridges which could support the denture bases, if the chewing forces were always vertical, if the upper ridge were exactly over the lower one throughout its entire extent and if all portions of the foundations were equal in their supporting value, the problem of stabilizing the dentures against anteroposterior shifting and against front-to-back teetering would be solved by paralleling the working occlusal surfaces with the alveolar ridges and placing them midway between the anterior and posterior ends of the ridges. But the problem is not so simple. There are certain modifying factors which must be found and coped with.

As already indicated, the first step in arriving at the mechanically ideal degree of jaw separation consists of paralleling the opposing alveolar ridges anterior to the bottom of the lower molar slope. But the alveolar ridge does not constitute the entire denture foundation. Therefore, the other supporting tissues, in so far as they face differently from the alveolar ridge, will alter the direction which the denture foundation itself faces. These modifying factors may alter also the degree of jaw separation.

For example, to the extent that the lower molar slope is of value in supporting the occlusal load does it permit us to decrease the degree of jaw separation, because the total lower denture foundation faces more anteriorly than does that part of the lower ridge first computed.

Conversely, the posterior surfaces of well developed maxillary tuberosities and the hard rugae zone, when used for support, permit us to increase this opening without wedging the upper denture anteriorly. Often the modifying factors in the upper and lower denture foundations exactly offset one another so that the opposing ridges remain parallel as originally fixed.

2. Thompson, J. R., The Rest Position of the Mandible and Its Significance to Dental Science. *J.A.D.A.* 33:131 (February) 1946.

3. Gillis, R. R., The Denture Space and Its Registration in Full Denture Construction. *Fort. Rev. Chicago D. Soc.* 11:5 (June 1) 1946.

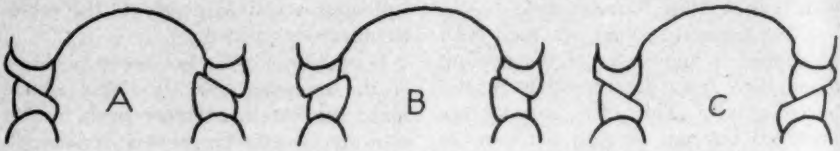

Fig. 1.—Schematic sections as seen from behind

As will be explained later, it is not only the inclinations of the denture foundations which govern the mechanically correct degree of jaw separation. Therefore, the casts alone do not afford sufficient information.

Altitude of Occlusal Patterns

There are factors which require the raising or lowering of the occlusal patterns, but there is comparatively little danger of serious deviation from the required height. The vertical position of right and left occlusal patterns may be accepted as about midway between upper and lower ridges.

Occlusal Patterns Seen From Front

In general, the occlusal patterns should be essentially horizontal as seen from the front. If the right and left sides were to be considered separately, the patterns, when horizontal, would be correct only at the ridge-crossing points. Only at these points is the upper ridge directly over the lower one. Anterior to these points, the under surface of the occlusal pattern of each side would face lingually, and posterior to these points it would face buccally, so that the pattern would lie at right angles to the interalveolar crest lines or the lines from ridge crest to opposing ridge crest.

However, when the two sides are joined solidly and when the patterns lie lingual to the ridge crests, there is generally no need for any alteration from the horizontal position. The principal exception to the rule is the case in which the stability of one denture is enhanced at the expense of its antagonist, which expedient is accomplished by tilting the occlusal patterns.

It is sometimes advisable to depart from the horizontal position for the purpose of increasing the stability of the lower denture, as advocated by Avery[4] and Pleasure,[5] but usually the same stability can be obtained in the lower denture by placing the occlusal patterns lingually, as will be considered later. This placement has the added advantage of maintaining the stability of the upper denture. When, under exceptional circumstances, it seems advisable to place the occlusal patterns somewhat buccal to their supporting ridges, a departure from the horizontal is indicated. However, the departure should be slight because of the corresponding damaging effect on one of the dentures. The effects of inclining the patterns laterally are indicated in Figure 1. In A, any vertical closing force on the right or left side would tend to shift the lower denture toward the left. The greater the vertical force, the greater the resultant horizontal force exerted on the supporting tissues. With the inclines as shown at B (Avery or Pleasure arrangement) the same horizontal shift of the lower denture toward the left would occur if the bolus were interposed on the right. With the inclines as shown at C (Monson arrangement)[6] the same horizontal shift of the lower denture toward the left would oc-

4. Avery, B. W., and Avery, S. K., A Scissor-Bite Denture Technic; Using Incising Angles, Parallel Planes and Diverging Grooves. *J.A.D.A.* 17:1303 (July) 1930.

5. Pleasure, M. A., Prosthetic Occlusion—a Problem in Mechanics. *J.A.D.A.* 24:1303 (August) 1937.

6. Monson, G. S., Applied Mechanics to the Theory of Mandibular Movements. *D. Cosmos* 74:1039 (November) 1932.

cur if a bolus were interposed on the left. To the extent that these occlusal inclines operate to change the resultant forces do the more tolerable vertical forces become converted into the less tolerable horizontal ones.

Occlusal Patterns Seen From Side

Alveolar Ridges in Relation to Their Antagonists.—I have already indicated that for maximum stability of the dentures the opposing alveolar ridges (or more exactly, the opposing denture foundations) must be parallel. Figures 1 to 4 show theoretically how denture bases tend to shift when parallelism of all involved areas is not achieved.

One of the criticisms leveled at cuspless teeth has been that they cause the mandible to slide anteriorly. It is true with artificial dentures that the so-called drifting mandible has been more common with cuspless than with cusped teeth, although many dentures in which cusped teeth have been used have failed to maintain the cuspal relation owing to settling of the bases. Atrophy of the ridge is always accompanied by a change in the anteroposterior occlusion of the teeth, destruction of the tissues that support the denture or both. Therefore, the occlusion never should be locked. To minimize the drifting, the occlusal plane should be set high at its posterior part if cuspless teeth are used. Of course, neither the pitch of the occlusal plane, the compensating curve or steep cusps will prevent the forward drift when resorption of the supporting tissues occurs.

A consideration of Figure 2 will indicate in exaggerated form how a malalignment of the occlusal plane can cause the lower denture, and with it the mandible, to be carried anteriorly.

A further disadvantage of this angle is that a given settling of the bases would cause greater closing of the jaws than in the case of the reverse angle shown in Figure 3, because the occlusal plane in Figure 2 is more nearly parallel with the arc of closure.

Placing the working occlusal surfaces of the teeth parallel with the denture foundations does not restrict us necessarily to the use of a flat occlusal plane. Suppose the angle of the occlusal plane, as shown in Figure 3, left, is correct for a given case. Here the entire occlusal plane is continuous. However, it may be broken, as indicated in Figure 3, right, by placing the mesial slopes of the lower cusps and the distal slopes of the upper ones at the same angle with the horizontal plane as shown in the sketch on the left.

The situation in Figure 3, right, may appear to be anatomic, but we have actually no cusps in the usual sense—merely a broken occlusal plane. The distal slopes of the lower cusps have no significance in this connection and do not basically influence the working occlusal surfaces shown on the left except to alter their extent.

When the working occlusal surfaces are restricted to their prescribed limits, only a small part of the occlusal plane comes into consideration. In fact, it is the anteroposterior restriction of these surfaces which makes possible the tilting of the occlusal plane without giving an unusual appearance to the alignment of the teeth. In most instances, the second

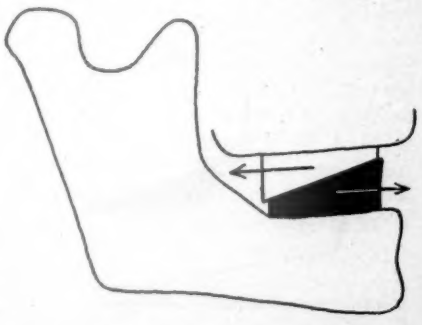

Fig. 2.—Occlusal surfaces as seen from the side. Closing pressure results in movement of the bases as indicated by the arrows

bicuspid and the first molar lie on the occlusal pattern, for which reason it would be convenient if these two teeth were furnished as a single unit.

Imagine a semicircular alveolar ridge as seen from the side (Fig. 4). A situation of this kind reduces the anteroposterior extent and choice of placement of the working occlusal surface. Even a slight anterior or posterior misplacement of this occlusal surface would induce a shifting of the denture base.

In this extreme example, closure on a tooth at A would cause a forward thrust. This would also be true of a tooth lying over the average lower molar slope.

Closure on a tooth at C would cause a backward thrust. Only at B would there be an absence of anteroposterior thrust. This demonstrates the fallacy of the common arrangement in which the lower molars are allowed to occlude when they overlie steep lower molar slopes. There is no difference in principle between the example shown and the average ridge contour; there is only a difference of degree.

Figure 5 suggests a means for practical verification of what has been computed theoretically regarding fixing of the posterior limits of the working occlusal surfaces.

With hard occlusal rims mounted on well fitted baseplates and with the occlusal surfaces at their proposed angles and altitudes, the patient bites farther and farther back on the rims until either a shift or a teetering is caused. This test is made separately for right and left sides.

By selection of different anteroposterior points on which the patient bites, it is possible to find the point or points at which the restoration can receive this closing force with the least tilting of the bases. In this test, it is not enough to move a center bearing point such as is used in making needle-point tracings; rather it is necessary to test the right and left sides separately.

There are, however, atypical cases in which parallelism of occlusal patterns with denture foundations may be impossible or at least not feasible. In these cases the patterns generally should be made parallel with whichever denture foundation needs favoring. For example, if the lower foundation is the weaker, the patterns are made parallel with this one, or at least more nearly parallel, transferring the horizontal component of force to the upper foundation which can withstand it better.

Posterior Part of Palatal Vault.—The posterior two thirds of the palatal vault usually faces in the same general direction as the upper alveolar ridge and does not affect the orientation of the occlusal

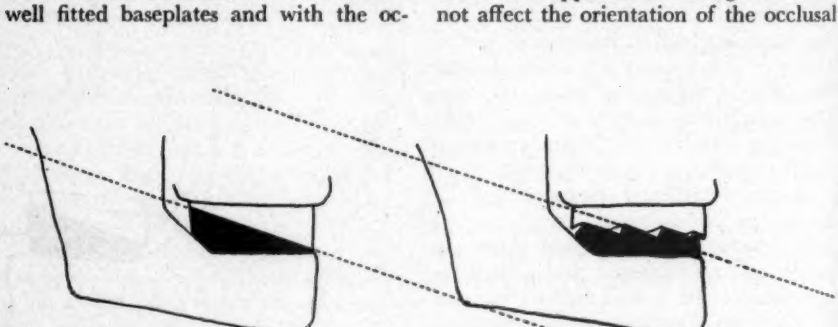

Fig. 3.—Occlusal surfaces extended beyond prescribed limits to give comparison between continuous and broken guidance in protrusion

patterns. In the atypical case in which the posterior part does not face in the same anteroposterior direction as the ridges, its modifying influence should be computed in order that the patterns may be tilted accordingly.

Rugae Zone and Maxillary Tuberosities.—The anterior part of the palatal vault, or rugae zone, does not usually face vertically but more or less toward the posterior part of the mouth. To the extent that this inclined portion is to be used to support the denture base in chewing and to the extent that it faces posteriorly, it calls for raising the posterior ends of the patterns.

Another area which sometimes permits tilting of the occlusal patterns is the posterior surface of the maxillary tuberosity. It constitutes a supporting surface against the anterior displacement of the upper base and permits, but does not require, the patterns to be given an additional elevation at their posterior ends.

Lower Molar Slope.—In connection with paralleling the opposing alveolar ridges, the portions of the lower molar slopes which were firm enough to afford support to the denture base were not considered. They should be considered now for their effect in elevating the posterior ends of the patterns. It should be stressed that these lower molar slopes are to be computed only as far back as they are firm enough to give real support to the denture base, from which it is clear that the cast alone does not give sufficient information. The supporting value of the lower molar slopes is learned by digital examination of the patient's mouth.

The more extensive the usable portion of the lower molar slope on right and left sides and the steeper the inclination, the more the occlusal pattern of that side will be elevated at the posterior end to make it parallel with the mean inclination of the lower foundation.

In many cases, the modifying factors just mentioned will influence only the

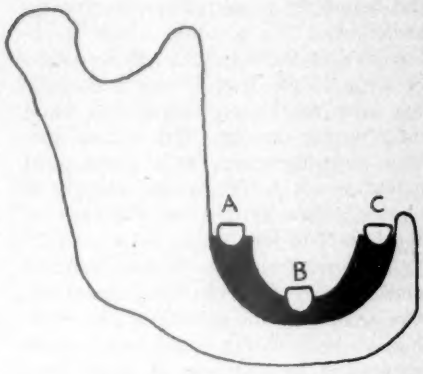

Fig. 4.—Exaggerated curve of lower ridge to show need for centralizing occlusion anteroposteriorly

inclinations of the patterns. However, if the upper modifying factors are stronger than the lower ones, a slight increase in the jaw separation is indicated. By this procedure, the parallelism of opposing ridges which first obtained is changed to parallelism of opposing foundations, the ideal for denture stability.

Pivoting of Mandible.—These deviations of the occlusal patterns from the horizontal, as seen from the side, would seem to violate the principle of statics which requires that the line of applied force be at a right angle to the support, until it is recalled that the temporomandibular articulation may be a factor in correspondingly altering the closing movement of the jaw. When, in the chewing range, the mandible pivots at or near the intercondylar axis, which is situated above and behind the occlusal areas, it follows that the mandible is carried anteriorly as it closes. This pivoting is demonstrated by the gradual protrusion of

Fig. 5.—Test bolus of a piece of ordinary felt impregnated with wax is easily placed where desired if mounted on a right angle explorer as shown or if held with cotton pliers

the mandible as the ridges become resorbed. But this pivoting which is observed with the resorption of the ridges or wear of the teeth is not necessarily the same as the pivoting of the mandible during chewing. The occlusal patterns must, therefore, not be tilted to the extent which might be desirable if all closing motion were to take place around the intercondylar axis.

As a matter of fact, the preferred chewing movement of most patients centers at or near the condyle of the working side without any anterior component movement on that side. It would seem then that only the open-and-shut type of chewing would call for tilting the patterns in harmony with the anterior component movement.

Unequal Resistance of Tissue.—So far, it has been assumed that the denture foundations are of equal supporting value in their various parts. This is not strictly true even in the so-called normal cases. For example, the anterior or posterior parts may be more yielding than the middle part of a foundation. When this is the case, the softer portion has less supporting value and should be left out of consideration; if only the posterior part is yielding, the anterior part is the part calculated.

The condition of unequal resistance of the tissues that will support the denture can be met sometimes more or less satisfactorily by the use of a soft or yielding lining. For example, suppose one must deal with a basal seat which is softer posteriorly than anteriorly. If, by means of a soft lining, the anterior part of the base could be provided with the same degree of resistance which exists in the posterior supporting tissues, the resistance from the front to the back would be so balanced that the entire basal seat could be considered as uniform for purposes of fixing the occlusal patterns. This is an extreme example, but it indicates that soft linings do not have their greatest value when they are of even thickness throughout but rather when they are thickest over the firmer tissues.

From this discussion concerning the mechanically correct inclination of the occlusal patterns as seen from the side, it is clear that this inclination depends on the protrusive inclines of the teeth, if cusped teeth are used. It now appears that, whereas in the case of so-called anatomic teeth, the mesial inclines of the lower cusps form angles with the horizontal so steep as to force the upper denture anteriorly and the lower one posteriorly under any degree of protrusion (whether through wear, resorption or muscle action), in the case of cuspless teeth the opposite difficulty has been met, that is, the upper denture is forced posteriorly and, more especially, the lower one is forced anteriorly. This is another way of saying that in general the occlusal plane has been too high in the posterior part for the anatomic teeth and too low for the cuspless ones. Without a consideration of all of the foregoing factors, the placing of the occlusal plane by the usual technics is necessarily unscientific.

Areas of Occlusal Patterns

The factors which govern the orientation of the occlusal patterns have been considered. It now remains to fix their limits.

Maximum Area of Occlusal Patterns.—The maximum area of the occlusal patterns is governed by the total supporting value of the upper or lower denture foundation, whichever is the weaker. In the typical case, the upper foundation can safely withstand more closing force than can the lower foundation, and so it is the lower one which limits the extent of the patterns.

Although the patient can bite just as hard on a small occlusal surface as on a large one, in practice he tends to exert that degree of force which is tolerable to the lesser foundation. For this reason, when the working occlusal surfaces of

the teeth are reduced in area, less force is required to chew the food and consequently there is less pressure on the supporting tissues. The force which is applied to the denture foundation of the right side, therefore, is controlled in large part by the extent of the working occlusal surfaces of the teeth on the right side, and likewise on the left side. The load which the tissues can carry safely is estimated on right and left sides separately, and the extent of the occlusal patterns is fixed accordingly.

The closing force required should be reduced considerably as compared with that of natural dentures by reducing the areas of the occlusal surfaces. There is no danger to the supporting tissues in carrying this reduction beyond the required amount, but there is a loss of mashing efficiency when this reduction is carried too far. Chewing consists of mashing as well as cutting, so that, whereas extremely narrow surfaces assure greater cutting efficiency, they at the same time reduce mashing efficiency. In computation of the allowable extent of the occlusal patterns, therefore, the requirements of both cutting and mashing should be kept in mind.

Buccal Limit.—Ideally, no part of the occlusal pattern should lie buccal to the ridge, because power applied buccal to this fulcrum produces a lever of the first order, or scissor type, which tends to lift the denture from its seat on the opposite side of the mouth.

Lingual Limit.—Placing the working occlusal surface lingual to the ridge produces a lever of the third or sugar tongs variety, in which the alveolar ridge of the working side becomes an end fulcrum and the resistant food determines the power point, thus stabilizing the base. The farther lingually the occlusal surface can be placed, the more evenly the load is distributed to right and left sides, but the necessity for tongue space limits any great lingual extension. In most cases, the lingual limit of the occlusal pattern may well lie just over the lingual border of the denture base.

Anterior Limit.—1. The total area of resistance offered by the working occlusal surfaces may be too great if extended to the anterior part of the alveolar ridge. This consideration is of least importance, especially since the total area of this surface usually may be better reduced by taking from the buccal side. 2. Too great extension anteriorly permits the patient to exert force too far anteriorly on the denture foundation, decreasing the amount of force exerted on the bolus and increasing the force on the temporomandibular articulation. 3. Pressure too far anteriorly may cause the denture base to teeter, especially if the anterior part of the foundation is comparatively yielding. 4. If in the patient's customary jaw relations the opposing teeth are permitted to occlude at a point anterior to the center of the foundation, the least degree of settling of the bases or the slightest wear of the teeth will shift the load to the more anterior surfaces, thus exaggerating the evil results just mentioned.

For all of these reasons, the opposing teeth should be prevented from occluding at the anterior parts of the foundation except in protrusion. This may mean that in the chewing range only the incisors and cuspids should be left out of contact. In some cases, it will call for depression of the bicuspids as well.

Posterior Limit.—The governing factor in the location of the posterior limit of the occlusal pattern is the posterior limit of the foundation of the lower denture. If any portion of the working occlusal surface extends farther over the basal seat posteriorly than the denture foundation, closing force exerted over this more yielding area would cause the denture to teeter. The situation would be much like that in which a plank lies unattached on a pier whose surface lies level with that of the water, part of the plank resting on the surface of the pier and the other part, say about a third, resting only

on the surface of the water. A person standing on the extended third would cause the edge of the pier to become a fulcrum, depressing that part of the plank resting on the water and raising that part over the pier.

In general, the posterior limit of the occlusal pattern should not be allowed to extend beyond the denture foundation. At the same time, the pattern should be carried well back without incurring hazards in connection with the other factors. If there are firm areas in the distobuccal extremities of the basal seat, these are computed. However, the working occlusal surfaces of the teeth cannot be safely extended to the posterior limit of the firm ridge when this portion presents too steep a slope in the lower molar region.

A special reason for extending the occlusal pattern as far posteriorly as the other factors will permit was suggested in connection with limiting the anterior overextension. It has to do with minimizing the upward pressure of the condyle against the articular surface of the glenoid fossa. Pressure at the joint is increased with a given closing force as the bolus or resistance is moved anteriorly. The situation which increases the force at the joint correspondingly decreases the force on the bolus. This in turn calls for increased muscle pull with consequent increased pressure at the joint. As the resistance is moved anteriorly, the increase of pressure at the joint mounts rather rapidly. If the patient is caused or permitted to exert closing force on food too far anterior to the point of muscle pull, the resultant upper pressure by the condyles may cause injury to the temporomandibular joint.

Nature has provided a mechanism which, with a full complement of teeth in good position, protects the temporomandibular joint against too great pressure, but this is true only with natural teeth. The artificial restoration can, and too often does, cause the condyles to exert excessive upward pressure.

It will be seen that the requirement of placing the load near the anteroposterior center of the foundation to avoid teetering of the denture base and the requirement of placing the load farther back to prevent the condyle from exerting excessive upward pressure are in conflict. However, the danger of damage to the temporomandibular joint when the load is placed near the anteroposterior center of the foundation is not so great usually as is the danger of damage to the denture-supporting tissues if the load is placed off center. Therefore, in the determination of the anteroposterior point at which the patient is to exert the major closing force, the chief concern of the dentist in the average case is protection of the denture foundation rather than protection of the temporomandibular joint. Both, however, should be kept in mind.

Conclusions

Some of the essential differences between the orthodox and the proposed schemes may be mentioned briefly.

The orthodox scheme is predicated on the use of pyramidal forms more or less like anatomic cusps; the proposed scheme calls for occlusal segments so contrived in form, placement and extent as to assure maximum stability of the dentures by control of the magnitude and direction of force on the foundations of the denture. In a comparison of the two schemes, it will be seen that the articulator adjustments for the horizontal component movements (whether protrusive, lateral or Bennett)[7] are of decreasing importance as the cusp angles are reduced.

According to the commonly accepted belief, the sagittal aspects of prosthetic

7. Bennett, N. G., A Contribution to the Study of Movements of the Mandible. *Proc. Roy. Soc. Med. Odont. Sec.* 1:79, 1907-1908.

occlusion comprise five factors requiring reciprocal adjustment: condyle guidance, incisal guidance, occlusal plane orientation, cusp height and compensating curve. Even in the anatomic scheme, the last two are open to question as coordinate factors. In the proposed scheme they have no significance or, to the extent that they are incorporated, they may be detrimental.

Cusp height itself is a misnomer. That which is spoken of as cusp height is not cusp height at all but the inclination of the articulating surfaces of the cusps. In sagittal articulation, it is the mesial inclines of the surfaces of the lower teeth and the distal inclines of the surfaces of the upper teeth which are significant, not the height or extent of the cusps. As used in the orthodox scheme, both cusp inclines and compensating curve have introduced factors which interfere with the stability of bases of artificial dentures because they have been contrived to assure continuous contact during jaw motion instead of being contrived to direct the force on the denture foundations advantageously during chewing. In the past, efforts have been too greatly directed toward balancing the occlusion of the teeth while the more important goal of balancing the load on the denture foundations, especially during chewing, has been neglected.

In the proposed scheme the factors to be considered are condyle guidance, molar guidance and incisor guidance. Since the condyle guidance is given by the patient, only two factors require manipulation: molar guidance and incisor guidance. These two factors can be mastered easily without consideration of cusp height and compensating curve.

The entire question of protrusive balance is comparatively unimportant, being overshadowed by the basic considerations here presented. Actually, the new scheme is easier to comprehend and to apply than is the orthodox one. It permits control of both the magnitude and the direction of the chewing force. It leads to the solution of the neglected problem of balance of the denture bases.

This new scheme, then, reduces the management of prosthetic occlusion to three simple steps: (1) paralleling the upper and lower denture foundations, (2) orienting and limiting the occlusal patterns and (3) adding a balancing occlusal unit. This last step consists merely of adjusting the lower second molar to maintain contact during eccentric relations.

According to the procedure here suggested, the working occlusal units are contrived to receive the chewing force at the desired degree of jaw separation, the balancing occlusal units are placed to maintain eccentric occlusal balance, and the buccal surfaces are placed independently to meet the esthetic requirements.

Since this procedure is more scientific than the orthodox one, patients for whom unsuccessful restorations have been made by the usual methods have been served more satisfactorily by this procedure.—*Tribune-Telegram Building.*

hemical Disinfection. —Chemical agents may in one concentration kill bacteria and in another dilution, or under a different set of conditions, merely inhibit bacterial growth. Disinfectants which are safe and/or practical for use on human tissues or dental instruments will usually not kill all bacterial spores including spores of pathogens. Many of them will not kill Mycobacterium tuberculosis.—*Accepted Dental Remedies, edition 14, page 59.*

MANAGEMENT OF YOUNG ANTERIOR TEETH WHICH HAVE BEEN INVOLVED IN ACCIDENTS

Joseph T. Hartsook, D.D.S., Ann Arbor, Mich.

ANY operative dentist who includes children in his practice today often is confronted with the problem of treating teeth that have been injured during an accident. With so much activity in sports and automobile trips, accidents that result in fractured, displaced and knocked-out teeth occur more and more frequently.

In the Children's Clinic at the University of Michigan School of Dentistry, letters which contain roentgenograms of periapical regions with badly fractured young permanent incisors are received almost every week. Frequently these letters state, "I have been watching these teeth to see whether anything would happen, and finally they abcessed. Now what shall I do?" The treatment of traumatized teeth has presented such a problem in the Children's Clinic that the staff members have found it necessary to work out scientific methods of treatment. These methods will be presented in this article.

Treatment Planning

Fortunately for the dentist, many parents are so concerned about the importance of the appearance of the anterior teeth that children who have had accidents are taken immediately to the dental office. Any shortening of the interval between the accident and the treatment affords the dentist a distinct advantage. Delay in treatment usually makes for a much less favorable outcome than prompt treatment.

If one or more of the clinical crowns of the anterior teeth have been fractured as the result of an accident, a roentgenogram of the periapical regions of these teeth is taken as soon as the patient is seen. The roentgenographic examination is made to determine the extent of the fracture, its proximity to the pulp tissue and the condition of the root. Frequently periapical roentgenograms of teeth adjacent to and opposing the injured tooth are taken to find out whether there are other fractured roots.

The vitality of all anterior teeth is examined by means of the Vitalometer, a high frequency pulp tester that induces a graduated response rather than a shock within the tooth. Occasionally an injured tooth will not respond to vitality tests immediately after severe trauma. Such a failure to respond to the current is not an unusual finding. If the vitality of the tooth is tested each week for a period of one or more weeks, it often is found that the vitality of the pulp returns.

Inasmuch as the program of treatment is designed to preserve the health of these injured teeth or to restore them to a healthy condition, the pulp tissue deserves and should receive attention immediately after the accident.

Although treatment has to be planned individually for each fractured tooth, there are three groupings into which these cases of fractured teeth may be placed according to the subsequent treatment demanded: (1) the cases in which

Read at the annual session of the American Dental Association, Section on Dentistry for Children and Oral Hygiene, Boston, August 7, 1947.

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Fig. 1.—Left: Traumatized mandibular central incisors of 9 year old patient. The teeth were only slightly loosened; they did not respond to repeated vitality tests, and they elongated at the fourth week. Putrescent pulps were found when the pulp chambers were exposed. Right: Mandibular central incisors with root canals filled after treatment and sterilization

the clinical crown of the tooth is loosened but not fractured or in which the fracture is so slight that little disfigurement of the incisal enamel results, (2) the cases in which a more severe fracture involves considerable dentin in addition to the enamel but which are not complicated by an exposed pulp, and (3) the cases in which the fracture has extended through the enamel and dentin into the pulp chamber, thereby exposing the pulp tissue to contamination by oral organisms.

Group 1.—In cases of injured teeth with slight fracture of the enamel, an incomplete examination may induce the dentist to decide that the teeth have not been involved seriously by the accident and that no further treatment except the judicious disking and polishing of the fractured enamel is necessary. Contrary to this decision, it has been found in the Children's Clinic that these traumatized teeth, even with little loss of tooth structure, may have had more extensive pulp damage from the force of the blow than might occur from a much larger fracture of the crown of another tooth (Fig. 1). This finding has promoted the thorough inspection of the teeth adjacent to and opposing injured incisors and has stimulated the roentgenographic examination and the repeated pulp testing of these associated teeth. Not infrequently, when there has been no accompanying fracture of the enamel, months later putrescent pulps of neglected teeth have to be treated in the Children's Clinic. Occasionally the patient even may have forgotten the accident.

Group 2.—Many of the injuries in this group, in which a portion of both the enamel and dentin has been lost but the pulp tissue has not been exposed, occur while the child is in the period of his mixed dentition. The two large protruding central incisors receive the force of any blow that comes in contact with the mouth. Early examination and treatment is especially advantageous because many of these teeth have extremely large pulps and incompletely developed roots. Occasionally a patient is seen in the Children's Clinic several months after an

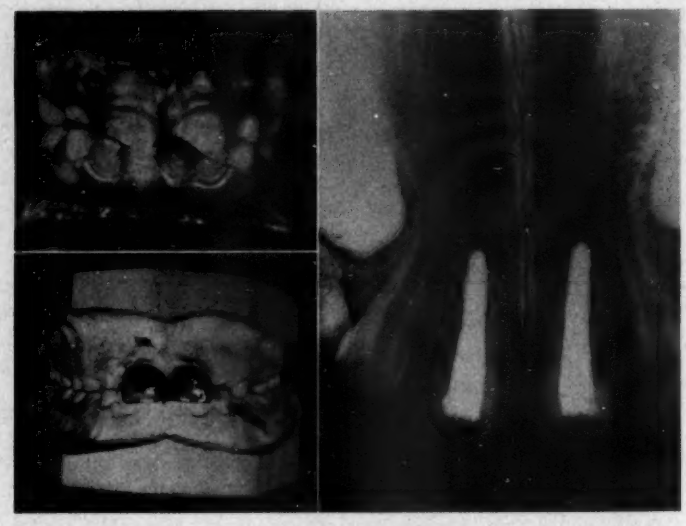

Fig. 2.—Left, above: Putrescent maxillary central incisors nine months after an accident which fractured the crowns without exposing the pulps. Right: Incompletely developed root apexes sealed off with gutta-percha cone after root canal and periapical sterilization. The sectional method of root canal filling was used. Left, below: Cast gold three-quarter crown restoration with acrylic windows

accident that has produced an extensive fracture without exposure of the pulp, and on examination the pulp is found to be putrescent (Fig. 2). Not infrequently the parent of such a child states that the child was taken to the dentist immediately after the accident and that since that examination the dentist has been observing the unprotected injured tooth to see whether anything would happen. When a fistula develops, the parent becomes seriously concerned about what can be done to save the tooth.

The fractured tooth that has lost both enamel and dentin without exposing the pulp receives careful treatment in the Children's Clinic.

Roentgenographic and vitality examinations are made. The exposed dentinal surface is wiped with a 95 per cent solution of phenol, and a small pad of thickly mixed zinc oxide-eugenol cement[1] is placed over the surface of the fractured dentin. Cavity lining varnish is applied over the pad of cement to maintain it in position while a temporary crown is being placed. A trimmed celluloid crown form is fitted to the injured tooth. Two small openings are made at the incisal angles of the crown form to permit the escape of air. The crown then is filled partially with thinly mixed silicate cement and is seated to seal off the fractured crown from contact with saliva. The fractured tooth thus treated is permitted a rest period of two to four weeks, the length of time depending on the health of the pulp, which should be determined as satisfactory before the tooth is prepared for the final restoration. Since it is difficult but highly important for the dentist to determine whether the pulp of a tooth is responding to trauma in a physiologic or pathologic manner, repeated vitality, roentgenographic and clinical examinations are

1. Formula No. 2, *Accepted Dental Remedies.* Chicago: American Dental Association, ed. 14, p. 175.

necessary during this rest and observation period. The emergency treatment and the rest period often provide the tooth with an opportunity to recover from the shock of the trauma while the protective covering prevents contamination of the dental pulp by an invasion of oral organisms.

If the injured tooth fails to respond to the vitality tests after an observation period of four weeks and if the root apex is incompletely developed, the tooth is anesthetized, the crown is isolated with a rubber-dam and, by use of an aseptic technic, access is gained to the pulp chamber. If hemorrhage occurs within the pulp chamber, the coronal portion of the pulp is removed to a level of a third of the developed portion of the root. The hemorrhage from the amputated pulp stump is stopped; calcium hydroxide powder, mixed with sterile distilled water to make a creamy paste, is adapted gently to cover the pulp stump, and the pulp chamber is closed with a thin mix of zinc phosphate cement. A periapical roentgenogram is taken of the treated tooth for the record, and the child is dismissed after an appointment has been made for the restoration of the fractured crown of the tooth. If, on entrance into the pulp chamber, the pulp tissue is found to be putrescent, a complete pulpectomy is performed, the root canal and periapical tissue are treated until sterile, and the root canal is filled by a large gutta-percha point, which will seal off hermetically the apex of the root. It appears that adequate and immediate emergency treatment prevents infection and degeneration of many injured young pulps.

Failure of the pulp of an injured tooth to respond to vitality tests is not considered an adequate criterion of pulp death. With an injured tooth that has a completely developed root apex and that fails to respond to the high frequency current, roentgenographic and clinical examinations are continued indefinitely or until a pathologic condition is indicated in the examination. Likewise, discoloration of the clinical crown of an injured tooth is not sufficient evidence to diagnose pulp death. A discolored tooth may maintain its vitality and present no pathologic condition in the periapical region subsequent to the injury which permitted the escape of free whole blood into the hard tissue of the crown to produce the discoloration.

In the Children's Clinic the restoration of choice for fractured crowns, with and without vital pulps, is a cast three-quarter gold crown with a silicate window and a cast pin for added retention. A tapered hole is drilled well out on the lingual surface of the cingulum. This three-quarter crown provides a restoration that will withstand a large amount of the careless abuse which may be anticipated because children fail to protect fine dental restorations. The three-quarter crown also provides an adequate esthetic restoration for the fractured tooth. When the tooth is prepared properly for this type of restoration, a very small amount of gold is displayed labially. Added retention for the crown may be obtained by carrying the pinhole to a depth of 2 to 2.5 mm. in the tooth in a plane parallel to the retentive grooves and parallel to the long axis of the root. Inasmuch as the anatomic structure of the pulp in a young permanent incisor is wide in its mesiodistal dimension but narrow in its labiolingual diameter, the pinhole preparation, if made in a plane parallel to the long axis of the root of the tooth, can be carried to this depth without endangering the pulp tissue (Fig. 3).

Group 3.—Immediate treatment of fractured crowns, which includes the treatment of exposed pulps, depends on the time available to the operator and the amount of laceration and swelling of the surrounding soft tissues. If sufficient operating time is available and injury to the soft tissue is not severe, the treat-

Fig. 3.—Gold three-quarter crown restoration with cast pin for added retention. Note the relation of the pinhole preparation to the pulp chamber

ment of choice of a vital tooth is pulpotomy (Fig. 4). For maxillary anterior teeth an infra-orbital injection often is used to reinforce the anesthesia produced by the infiltration injection. Occasionally it is found necessary to reinforce the anesthesia further by injection into the nasopalatine canal, or by injection of a small quantity of a 2 per cent solution of procaine hydrochloride with 1:50,000 epinephrine directly into the pulp chamber. For mandibular incisors the inferior dental block and long buccal injections are employed. Recently an evaluation[2] has been completed of pulpotomies performed for vital anterior and posterior teeth of both the deciduous and young permanent dentitions, after the exposure of pulps by trauma, caries or excessive instrumentation during cavity preparation. This evaluation indicates 90.2 per cent success in the 92 cases studied. Of the 83 pulpotomies classified as successful, 65 per cent presented postoperative roentgenographic evidence of a band of calcification slightly apical to the site of the pulp amputation.

If the fractured crown is to be prepared for the final restoration at an appointment after the pulpotomy, the crown is covered with a trimmed celluloid crown form containing a thin mix of silicate cement, and a periapical roentgenogram is taken for the record. Occasionally a celluloid crown form wears through at the incisal edge and slides gingivally on the tooth. To prevent unnecessary damage to the supporting tissues, the patient is asked to return within a week after the initial appointment to have the celluloid crown form removed.

If time does not permit a pulpotomy immediately after the accident or if the tissue is badly lacerated and swollen, the exposed pulp tissue is wiped with phenol and covered with a pellet of cotton containing eugenol. A contoured, fitted celluloid crown form containing a thin mix of zinc oxide-eugenol cement is sealed gently over the fractured crown, an early appointment for subsequent pulp treatment is made, and the patient is dismissed. Long postponement of the treatment of contaminated pulp tissue favors degeneration and increases the complexity of future treatment, especially for young permanent teeth which have incompletely developed roots. The treatment of putrescent young permanent anterior teeth with incompletely developed roots presents the problems of treating the pathologic condition and maintaining the tooth and its periapical supporting tissues in a good state of health.

One method of treatment that has been used successfully in the Children's Clinic consists of the sectional method of filling the wide-open root canal after the canal and periapical region have been rendered free from bacteria (Fig.

2. Brown, W. E., Jr., The Pulpotomy Technic for the Management of Vital Exposed Pulps in Primary and Young Permanent Teeth. *Mich. Univ. School of Dent. Alumni Bul.* 48:14 (August) 1947.

2, right). The treatment consists of enlarging and smoothing the root canal and hermetically sealing off the root apex with one large mass of gutta-percha calibrated and measured to seal off the apical third of the root. The measurements can be made from an accurate roentgenogram and transferred to the instruments used to set the gutta-percha mass. Equal success in the treatment of putrescent anterior teeth with widely divergent root ends has been obtained by overfilling the root canal, extending the gutta-percha points beyond the root apex and following the root canal filling with surgical resection of the root apex and curettage of the periapical debris (Fig. 5).

Displacement of Teeth

Accidents that loosen, displace or knock teeth out of the mouth and fracture roots present to the operative den-

Fig. 4.—A, Exposed pulp of incompletely developed maxillary left central incisor of a 9 year old patient. B, After pulpotomy a gold restoration was placed on the tooth. C, One year later, a second accident fractured the same tooth in addition to the right maxillary central incisor and both mandibular central incisors. Note the band of calcified secondary dentin produced after the pulpotomy and the continued development of the root end of the maxillary left central incisor one year after the first injury. D, Gold restorations on both maxillary central incisors. E, Mandibular incisors fractured at gingival attachment, with root canal fillings and stock crown restorations placed on mandibular incisors. F, Mandibular incisors nineteen months after resection

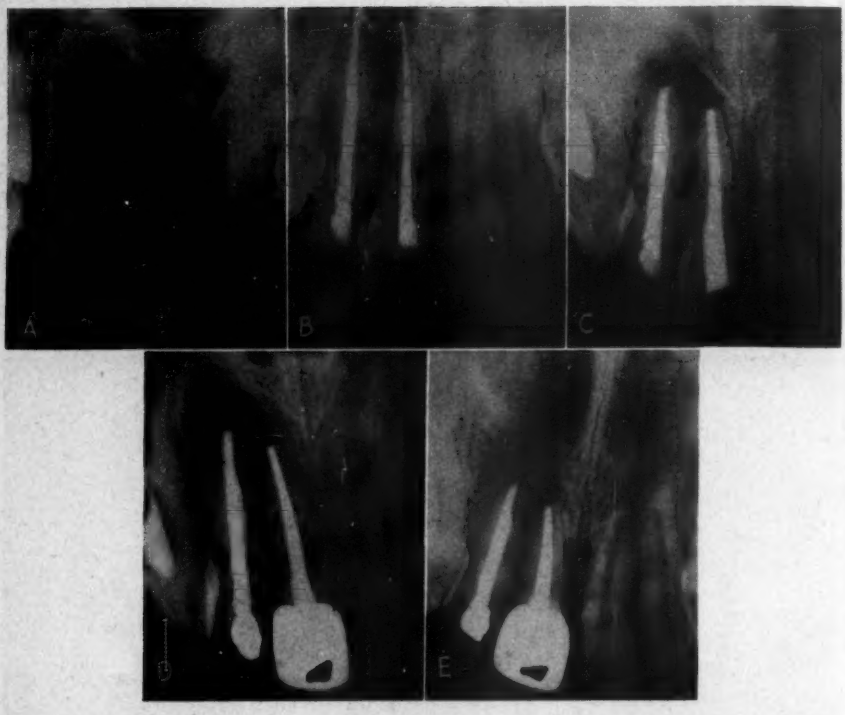

Fig. 5.—A, Pathologic condition involving the periapical regions of the maxillary central and lateral incisors. B, Condition treated and the root canals overfilled with gutta-percha. C, Surgical resection and curettage. D, Placement of gold restoration on central incisor. E, Restoration of bony architecture, as shown by routine postoperative check-up

tist additional problems of pulp treatment.

Teeth that have been severely loosened and displaced from their natural alignment within the arch are examined roentgenographically in order to detect fractured roots. Digital manipulation of the involved teeth often is employed to return the displaced teeth to their proper alignment. The teeth are stabilized slightly out of occlusion by means of ligation to a stable ribbon arch wire. The vitality of all anterior teeth is determined at the initial appointment, and the vitality is re-examined periodically until the tests indicate that the pulps of the involved and associated teeth are recovering from the injury or are degenerating. All future treatment of the involved teeth depends on the response of their pulps. The stabilizing wires are removed after the teeth have become firm within the alveolar process, and this stabilization frequently occurs within two to three weeks. It has been observed that many teeth which are loosened only slightly in their sockets or which have suffered only a minor lateral or anteroposterior displacement will become firm without stabilization, but pulp degeneration frequently follows this type of injury. Deciduous teeth that have been driven rootward into the alveolar process as the consequence of an accident often will reerupt, align and stabilize themselves without treatment (Fig. 6). If the young

patient is mature enough to provide an accurate response, frequent vitality examinations are made until the response of the pulp to the injury has been determined to be physiologically satisfactory.

The treatment of a young permanent anterior tooth that has a fractured root depends on the evidence obtained from the roentgenographic examination, the vitality tests and the clinical examination. If the roentgenogram indicates that the root fragments are in close proximity to each other and if it is determined from the clinical examination that the coronal fragment is tight within its socket, no treatment is given the tooth except frequent vitality tests to determine the health status of the pulp. Frequently the continuity of the root will be restored soon after the accident as a result of the deposition of cementum at the site of the fracture. If a root fracture occurs rootwise to the attachment of the gingival tissues and the coronal fragment of the tooth is loose within the alveolar process and subject to continuous movement, or if the root fragments are not in close proximity to each other, the fragments are realigned to close proximity and the coronal fragment is stabilized, as previously described, in a position just out of occlusion. This step restricts movement and permits the deposition of cementum or osteoid tissue along the line of fracture so that a satisfactory union between the root fragments can take place. Vitality returns to many teeth that have fractured roots, and, again, frequent examination of the vitality of the pulps is good practice.

If the root of an anterior tooth is fractured and part or all of the fracture line occurs within or passes through the gingival crevice, union of the fragments seldom, if ever, occurs. This is due possibly to the absence of cementoblast cells and also to the fact that the healing processes are interfered with by the continuous presence of contaminated debris at the site of the fracture. Teeth with this type of fracture have been treated successfully in the Children's Clinic by complete removal of the pulp tissue. The root canal is enlarged, rendered sterile and filled with gutta-percha points. The clinical crown then is removed, a steel post is fitted to penetrate one half to two thirds the length of the root canal and the post is cemented to place. The area is dried, and the patient's own crown is cemented back onto the root (Fig. 7). The approximation of the crown has been found to be accurate and well tolerated by the gingival tissues since no inflammation follows this treatment.

Replantation of Teeth

When young incisors are knocked completely out of the alveolar process, replantation is advisable if the patient can be treated soon after the accident. The formation of a firm blood clot within the tooth socket and the degeneration of the cementoblastic layer of the root which occurs with delay in replantation hinder a successful outcome. When a patient reports promptly with the tooth after an accident, an anterior occlusal roentgenogram is taken immediately to determine whether the roots of adjacent teeth are fractured in this part of the mouth. The knocked out tooth is washed with green soap and water, care being taken not to remove any of the periodontal fibers which remain attached to the cementum. The tooth is kept moist in a cotton gauze sponge that has been satu-

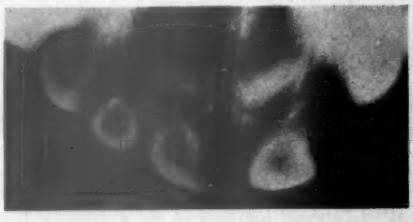

Fig. 6—Deciduous incisors embedded in alveolar process. They began to re-erupt the fifth, sixth and seventh week after the accident

rated with physiologic saline solution. An opening is made into the pulp chamber, the entire pulp tissue is removed and the root canal is enlarged and smoothed after sterilization with a 95 per cent solution of phenol. The canal is filled, the apex being sealed off with well condensed gutta-percha root canal points. A general anesthetic usually is employed during the process of replantation in a preschool patient. The blood clot is curetted from the base of the socket, and the moistened tooth is forced back into its hemorrhaging socket, aligned and stabilized just out of occlusion. An adapted 0.028 stainless steel ribbon arch wire is ligated to the healthy teeth in the anterior segment of the arch, and the replanted tooth is ligated to the stabilized arch wire with 0.010 stainless steel ligature wires.

The type of ligation that is employed for the stabilization of replanted teeth depends on the individual case. One method of ligation that has been used successfully in the Children's Clinic consists of two loops of ligature wire, one gingival and one incisal to the arch wire, for all of the firm uninjured anterior teeth to hold the arch wire in place. The replanted tooth is retained in its socket and stabilized to the arch wire by a single loop of ligature wire (Fig. 8).

The stabilization of the replanted tooth is maintained until the tooth has become re-attached and firm within its socket, usually a two to four weeks' period. Root resorption occasionally fol-

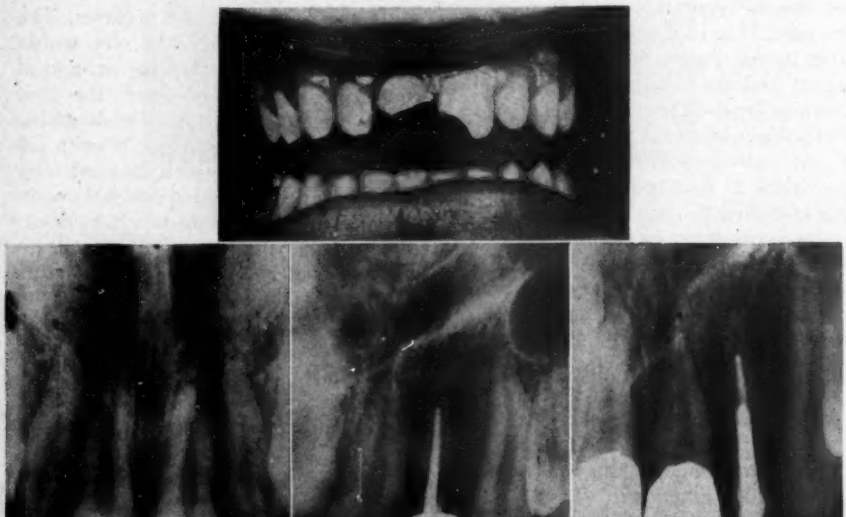

Fig. 7.—Above: Teeth of 15 year old patient immediately after an accident which exposed the pulps of both maxillary central incisors and fractured the root of the maxillary right lateral incisor through the area of the gingival crevice and again a third up the length of the root. Below, left: Pulpotomies were performed on the central incisors, and the fractured crowns were restored with gold three-quarter crowns with silicate windows. Below, center: Fractured root of lateral incisor with root canal filling and steel post in root canal. Below, right: Clinical crown cemented back onto the root. The apex of the root later was resected

lows replantation. Early and careful handling of the knocked out tooth during the time that the pulp tissue is being removed and the root canal is being filled is encouraged to prevent unnecessary injury to and degeneration of the root tissues. Resorption probably will follow the replantation of the root if the activity of the cementoblastic layer fails to re-establish itself.

Summary

Although treatment for fractured crowns has to be planned individually, there are three groupings into which these teeth may be placed as determined by their subsequent treatment.

In the first group are those cases in which there are only slight fractures of the enamel, usually part of an incisal angle. Roentgenograms of the periapical regions, periodic vitality examinations and disking and polishing of the disfigured enamel surface are indicated.

In the second group, in which both enamel and dentin are involved, roentgenographic examination, vitality testing, sedation from a dressing placed over the exposed dentin surface, and sealing off of the entire crown from mouth organisms by a trimmed celluloid crown form which contains a thin mix of silicate cement are employed. These steps provide the proper care during a rest and observation period in which the response of the pulp tissue to the trauma can be determined by repeated systematic vitality tests. The combination of a silicate window in a cast gold three-quarter crown, which has a cast lingual pin for added retention, makes a satisfactory restorative treatment for these fractured teeth.

In the third group of coronal fractures are those in which the vital pulp is exposed. Pulpotomy provides a satisfactory treatment for the exposed pulp tissues. If, however, the pulp has become putrescent, it is removed completely from the pulp chamber and root canal, and after sterilization of the root canal it can be filled with well condensed gutta-percha points and hermetically sealed at the apex.

Teeth that have been loosened or displaced severely in the alveolar process may be realigned by digital manipulation and stabilized just out of occlusion. Deciduous teeth that are driven rootward into the alveolar process may re-erupt after a time if simply left alone by the dentist.

The treatment of young permanent anterior teeth that have fractured roots depends on the roentgenographic, vitality and clinical examinations. When the fragments are in close proximity and the coronal fragment is tight in its socket, no treatment other than pulp testing is employed. If the fragments are not closely approximated or if the coronal fragment is loose in the alveolar process, realignment and some form of mechanical stabilization are indicated so that the continuity of the root can be re-established by the activity of the cementoblasts. Periodic vitality examinations will indicate the type of response that the pulp is furnishing.

A tooth that has been knocked completely out of its socket can be replanted after the root canals have been sterilized and filled, if the patient reports promptly after the accident. The replanted teeth

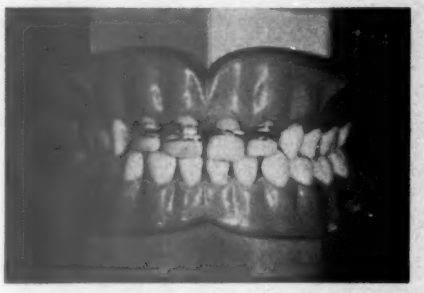

Fig. 8.—A method of stabilization for loosened and replanted teeth, using 0.028 stainless steel ribbon arch wire and 0.010 ligature wire

can be stabilized just out of occlusion until they re-attach in their sockets.

Conclusions

Thorough examination and immediate treatment of injured young anterior teeth may prevent future degeneration of the pulp.

The physical appearance of injured teeth does not indicate necessarily the physiologic status of the pulp since teeth with little or no displacement or coronal fracture may have suffered severe damage of the pulp.

Clinical examinations, roentgenograms and repeated systematic vitality tests in order that regenerative or degenerative changes within the pulp tissue can be determined serve as aids for the diagnosis and prognosis of the health of the pulps of injured teeth.

The immediate sedation and sealing off of exposed dentin from oral organisms may prevent future degeneration of pulp tissue and hasten the recovery of the pulp.

Pulpotomy of a vital tooth is a successful treatment for exposed pulps when the teeth can be treated soon after the accident.

Roentgenographic examination to determine whether a root fracture is present and the digital manipulation and stabilization of severely loosened and displaced anterior teeth provide the pulp and the tooth with an environment that may promote the recovery of health by the tooth and its surrounding tissues.

Restoration of the continuity of fractured roots frequently occurs if the root fragments are in close proximity and are stable within the alveolar process.

Teeth that have been knocked completely out of their sockets may be replanted successfully if replantation can be employed soon after the accident.

Since there are so many scientific methods of treatment that the dentist may employ in the treatment of injured young anterior teeth, there are, provided the patient and his parents cooperate intelligently, few instances in which young anterior teeth need to be sacrificed because of accidents sustained by the anterior portion of the mouth.

Fatalities From Outdoor Sports.—Precise information is lacking, but it is estimated that about 3,000 boys and men, ages 15 years and older, are accidentally killed each year in the United States while engaged in one or another outdoor sport. Many times this number sustain nonfatal injuries of varying degrees of severity. . . .

Hunting alone was responsible for a little more than 10 per cent of all deaths from outdoor sports. As one would expect, a very considerable proportion of deaths in hunting accidents, about three fourths, were due to wounds inflicted by the discharge of firearms either by the injured person or by another. . . .

Fishing took more than twice as many lives among men as did hunting. This does not necessarily mean that fishing is more hazardous than hunting. Actually, the relative dangers in various sports cannot be measured, since there is no accurate information regarding the number of men who take part in them. Of the fatalities attributed to fishing accidents, almost two thirds were the result of drownings involving mishaps in small boats. . . .

Swimming and bathing, of all sports, claimed the largest number of lives. . . . Nearly one half the deaths resulting from this pastime occurred among young men 15 to 19 years of age.—*"Dangers in Outdoor Sports," Statistical Bulletin, Metropolitan Life Insurance Company, October 1947.*

CENTRIC RELATION OF THE MANDIBLE

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THE following discussion of centric relation of the mandible is not presented from the standpoint of the teacher, scientist, researcher or specialist but from the standpoint of a dentist with thirty-five years of general practice. For the past fifteen years I have been irresistibly attracted to a study of disturbances arising from eccentric mandibular relationship. I have found myself confronted by the problem of determining whether or not a variety of symptoms were due to eccentric position of the mandible. This subject has been discussed ably throughout the years by many eminent dentists, but the necessity of finding and recording centric position of the mandible and of constructing dentures in harmony with the findings should be emphasized further. Two outstanding developments in dentistry in the last few years have made dentists realize the importance of determining centric position of the mandible; namely, (1) the almost universal practice of providing immediate dentures, and (2) the well established and well recognized fact that many disturbances, some serious, are the result of eccentric mandibular position, when the teeth, either natural or artificial, are brought into centric occlusion or the physical rest position.

Definition

Webster defines the word "centric" as "placed in or at the center or middle." In applying this definition to the mandible, it must mean that all muscles and ligaments that move or stabilize the mandible are in natural position and at natural tension and that the condyles are in natural position in the glenoid fossae. When the mandible moves from centric or physiologic rest position to the position where the teeth are in centric occlusion (physical rest position), there should still be perfect muscular balance. The condyles should still be in their normal positions in the fossae, although power is exerted.

Muscular Overextension

One of the basic problems in the construction of full dentures is to find and record the centric relation of the mandible to the maxillae. If this is not done, use of the dentures may cause some muscles to be overextended while in other muscles the normal distance between the origin and insertion of the fibers will be shortened. In the former case, the tone is increased beyond normal, and in the latter there is loss of tone. Harris[1] showed the devastating effect on the temporomandibular joint of overextension of the external pterygoid muscles through loss of vertical dimension. He emphasized the fact that the mandible is a living bone and subject to the laws that apply to other living bones, including Wolff's law, which states that the external form and internal structure of living bone is determined by the

Read at the meeting of the Academy of Denture Prosthetics, Miami, Fla., October 8, 1946, and at the meeting of the American Full Denture Society, Chicago, February 8, 1947.

1. Harris, H. L., Effect of Loss of Vertical Dimension on Anatomic Structures of the Head and Neck. *J.A.D.A. & D. Cosmos* 25:175 (February) 1938.

muscular forces exerted on it. Thompson[2] said that "muscles overextended or stretched beyond their given length, by certain dental procedures, will return to that given length at the expense of other tissues."

Dentition

In the mouth of the edentulous child, there is centric relation of the jaws. Thompson[2] stated that the rest position of the mandible is established when a child is only a few months old and probably remains constant throughout life. This is a fundamental which, if accorded proper respect, will aid greatly in the construction of dentures. It is only when dentition begins that a possibly disturbing element is introduced. If dentition proceeds in harmony with muscular balance and natural condylar position, there is centric mandibular relation in both the physical and the physiologic rest position. Unfortunately, the teeth do not always erupt in such position that centric occlusion of the teeth is in harmony with the required muscular balance and condylar position. Moreover, teeth that start out in full accord with these requirements rarely remain so throughout life. Because of disease, accident or wear, tooth structure is lost, and the once perfect centric occlusion of the teeth becomes a makeshift, functional occlusion entirely out of harmony with all of the requirements of centric mandibular relation. Because of pain, loss of teeth or other factors, the person may have been forced to chew in an unnatural position over a long period of time. Therefore, the acquired functional occlusion should not be accepted as the position to which immediate dentures should be fitted. When a person has reached the point where full dentures are indicated, it is safe to assume that he may have acquired some eccentric mandibular habits. It is the duty of the dentist to determine whether this is the case.

Until recent years, almost no one had dentures made within a period of six months after teeth were removed. Frequently the waiting time was much longer. Dentists found that better results were obtained if they waited before making dentures; they reasoned that the gums should have this much time in which to shrink. In my opinion, the good results were not due so much to the thorough shrinkage of the gums as to the fact that during this long edentulous period the muscles had time to recover from the abuse of being forced to function in unnatural positions and under unnatural tensions. In the edentulous state, there was nothing to guide or force the jaw away from the suspended centric position. The muscles, therefore, returned to their natural rest position, the condyles assumed their proper position in the fossae, and the mandibular balance present during edentulous childhood was restored. When the time came to take the bite, the patient, who by this time was free from any undesirable mandibular habits, could cooperate better than he could have immediately after the extractions.

Diagnosis

Missing the determination of centric position or, as dentists usually say, "missing the bite" in the construction of dentures results in a great variety of symptoms. Few, if any, of these are pathognomonic. This being the case, it is imperative that dentists become capable diagnosticians and that they consult and cooperate with physicians in order to identify and eliminate the causes of the symptoms.

Bustetter[3] has found that eccentric mandibular positioning may cause the

2. Thompson, J. R., The Rest Position of the Mandible and Its Significance to Dental Science. *J.A.D.A.* 33:151 (February 1) 1946.

3. Bustetter, J. R., Personal communication to the author.

following subjective symptoms: 1. The patient may be positive that he lacks sufficient muscular power to masticate food properly. 2. He complains of being unable to find a comfortable position with the teeth closed. 3. He must grope in a conscious effort to find a position in which mastication is possible. 4. Generalized soreness of the denture-bearing areas is present, usually in the arch where there is least denture stability but sometimes in both arches. 5. There is localized soreness which has a tendency to change from place to place. 6. There is lack of retention when mastication is attempted or during speech, particularly if there is lack of sufficient physiologic rest space. 7. Swallowing, with or without a bolus of food, is difficult. 8. Various symptoms of temporomandibular joint disturbances are present.

The objective symptoms noted by Bustetter are mostly a confirmation of the subjective symptoms, plus the following: 1. The patient usually exhibits a loss, minor or major, of most of the ordinary mandibular movements, using so-called hinge movements. 2. Excessive saliva is produced when dentures are worn. 3. The patient avoids wearing the dentures. 4. Excessive amounts of denture adhesives are used. A large quantity cushions the denture and permits it to move into a better relationship. 5. Chin protrudes or is not in midline of head when teeth are closed in their centric position (Fig. 1).

In his book, Swenson[4] says,

> Occlusion is the most important subject in all departments of dentistry, with the possible exception of surgery. . . . Centric occlusion would mean, strictly speaking, the teeth in contact when the mandible is in centric relation to the head.
>
> If the teeth and joint are in harmony as to their inclinations in centric occlusion and during eccentric movements, we can expect the joint to remain healthy. However, when the inclines of these factors are not in harmony, because of loss and shifting of teeth, excessive wear of cusp inclines, or incorrectly constructed restorations such as inlays, crowns, fixed bridges, partial and complete dentures, a pathological condition may result. . . . This diseased condition of the joint may manifest itself by clicking sounds, by neuralgia, by obscure headaches, by pain and discomfort in the joint during mastication, by a burning sensation of the tongue, and sometimes by the onset of trismus of varying degrees. A detailed study of these conditions has been made by Costen, Schuyler, Maves, Goodfriend, and many others. The presence of these symptoms must not be construed as always being the result of occlusal disharmony; yet this occlusal disharmony must always be investigated as a potential etiological factor whenever these disturbances are present. Schuyler, in a report of over one hundred cases of joint disturbance, found that there was a definite relationship between temporomandibular joint and tooth disharmony.

The classic picture of Costen's syndrome,[5] with which most dentists are familiar, has proved reliable for more than a decade, although Costen's explanations of the origin of some of these symptoms have been vigorously challenged. In several hundred cases, both practical and experimental, in my own office and in collaboration with Louis S. Block, also of Louisville, the symptoms listed by Costen have been a good guide.

If dentures are constructed according to eccentric relationship, some muscles may be overextended and some may be shortened; some nerves may be pinched or encroached upon, and circulation through some vessels may be hindered. Immediately, questions arise as to how muscles, nerves and blood vessels react or behave in the presence of, or as a result of, the interferences mentioned. Thompson[2] and Harris[1] have given us

4. Swenson, M. G., *Complete Dentures*. St. Louis; C. V. Mosby Company, 1940, pp. 435-437.

5. Costen, J. B., Syndrome of Ear and Sinus Symptoms Dependent Upon Disturbed Function of the Temporomandibular Joint. *Ann. Otol., Rhin. & Laryng.* 43:1 (March) 1934.

the answers as to muscles. Overextended muscles, while returning to their original length, may show fatigue and cause pain which may result in spasm, either clonic or tonic. Too great a vertical dimension will overextend the masseter, temporal and internal pterygoid muscles, while the external pterygoid muscle will be shortened. The former muscles will return to their normal length at the expense of the alveolar processes, whereas the external pterygoid muscle will lose tone and become flabby. If vertical dimension is too short, the external pterygoid muscle is overextended and returns to its natural position. In the presence of full dentures, this is done by protruding the mandible (Fig. 1, above), in which case the lower denture performs the feat which is sometimes called "jumping the bite." However, I have seen some cases in which the return of the external pterygoid muscle was at the expense of the condyle (Fig. 2). The other three muscles are shortened, lose tone and become flabby, giving the appearance of age prematurely (Fig. 1, above).

Fig. 1.—Above: Front and profile views of patient wearing old complete dentures. Note protrusion of mandible, loss of vertical dimension, premature appearance of age and deviation of chin from midline. Below: Patient wearing new dentures. Note correct centric relationship and restoration of vertical dimension and facial contours (courtesy of J. R. Bustetter, Louisville, Ky.)

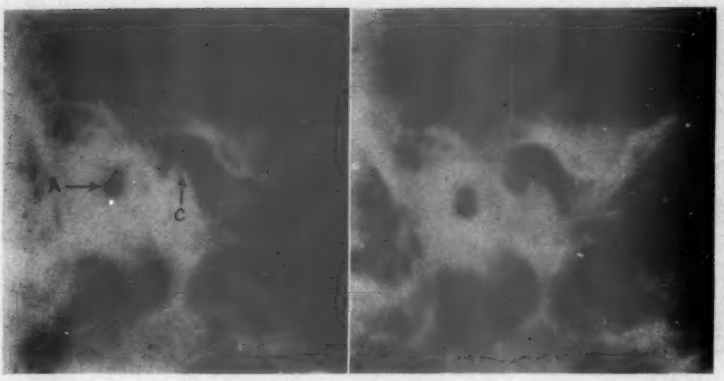

Fig. 2.—Left: Necrosis of condyle and neck, with only jagged stub remaining. Position of stub in posterior part of fossa, with old dentures in place, is shown. (A) ear, (B) eminentia, and (C) stub of condyle. Right: Stub moved forward and away from posterior wall. New dentures in place. The patient had had excruciating pain for more than a year, had been unable to chew, was highly nervous and despondent and was unable to lie on the affected side. With new dentures that restored the mandible to centric relation, relief was instantaneous and has continued for the last eight to ten years

To determine how some nerves behave under pressure, it is necessary only to observe the effect of pressure on the mental branch as it passes through the mental foramen when excessive absorption has left that foramen on top of the bone instead of on the buccal side. Gentle pressure with even the soft finger produces pain in the lip supplied by this branch. A burning sensation and pathologic changes may be caused by pressure of the denture on the incisive papilla which covers the incisive foramen from which nerves and blood vessels emerge to supply the anterior part of the mouth. This demonstrates the reaction to pressure of blood vessels as well as of nerves. Since both nerves and blood vessels traverse the posterior portion of the glenoid fossa, a knowledge of the anatomy of the auriculo-temporal nerve, the chorda tympani nerve and the tympanic branch of the internal maxillary artery is necessary for an understanding of problems associated with the temporomandibular joint. This information is given in detail by Gray.[6]

There is a definite position of the condyle in the glenoid fossa when the mandible is in centric relation, and that position is in the anterior part of the fossa, never in the posterior (Fig. 3). Authorities for this statement are the textbooks on anatomy by Gray,[6] Cunningham,[7] Piersol[8] and Morris.[9] If the mandible is in centric relation, the condyles cannot be in the posterior part of the fossae. This is a fundamental principle. The reactions evoked when the condyle is permitted, or even worse, forced to intrude on this area furnish an interesting field for research. The condyle is provided with an armor consisting of the capsule, disk, meniscus and synovial sacs. All this constitutes a bulky plunger, and one wonders whether it would be possible for pressure of a hydraulic type to be directed through the petro-tympanic fissure

6. Gray, Henry, *Anatomy, Descriptive and Surgical.* Philadelphia: Lea Brothers & Co., 1897, pp. 560, 728, 734.
7. Cunningham, D. J., *Text-Book of Anatomy.* New York: William Wood & Company, 1930, pp. 150-152.
8. Piersol, G. A., *Piersol's Human Anatomy.* Philadelphia: J. B. Lippincott Company, 1930, p. 2151.
9. Morris, Henry, *Human Anatomy.* Philadelphia: P. Blakiston's Son and Co., 1899.

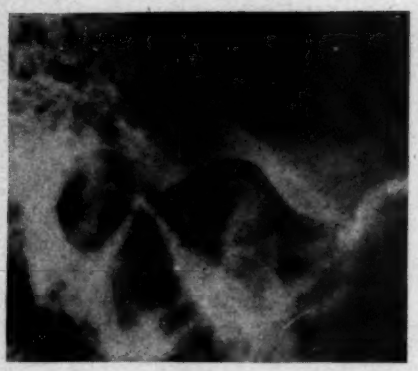

Fig. 3.—Normal temporomandibular joint, with normal set of teeth in centric occlusion. Centric relation of the mandible and centric occlusion of the teeth coincide and produce a normal temporomandibular joint. Note the wide space between the condyle and the tympanic plate in front of the ear. This space accommodates the nerves and blood vessels that traverse the posterior part of the glenoid fossa. Note relation of condyle to eminentia

into the middle ear (Fig. 4).

Are some types of tinnitus caused by invasion by the condyle of the posterior part of the fossa and compression of the anterior tympanic artery which supplies a large part of the lining of the middle ear? That pressure on the auriculotemporal nerve is responsible for some cases of neuralgia is recognized by many physicians and dentists.

It also is possible that a general relaxation and shortening of the muscles of the mouth, including the tensor veli palatini, may contribute to a failure of the eustachian tube to open, thereby impairing the hearing.

Occlusion

I have quoted Swenson on the importance of occlusion. Few will deny that, with the possible exception of surgical operations, occlusion is the most important of our work as dentists. If the surgeon is going to perform his most important operation, careful preparation of the patient is observed. Yet what special preparation of the patient is made for the important procedure of determining and establishing centric relation of the mandible, otherwise known as taking the bite? Personal problems, difficulties encountered on the way to the office, fatigue or apprehension may cause the patient to arrive in a condition far removed from the relaxed state necessary when recording centric relation. Many tense persons cannot respond sufficiently to soothing words, manner and manipulation, so I find it necessary fairly often to resort to medication. For this purpose I use pentobarbital sodium in capsules containing 1½ grains each. It is not unusual to administer 3 grains or more before relaxa-

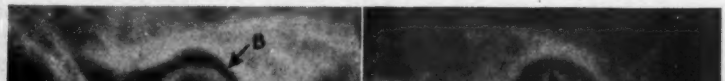

Fig. 4.—A, Large petro-tympanic fissure, left side. B, Unilateral (left condyle) posterior displacement. C, Presumably calcific deposit on superior surface of the right condyle. The symptoms consisted of crepitus of the right joint with pain on movement, a stuffy feeling and tinnitus in the left ear, and typical sore throat on the left side

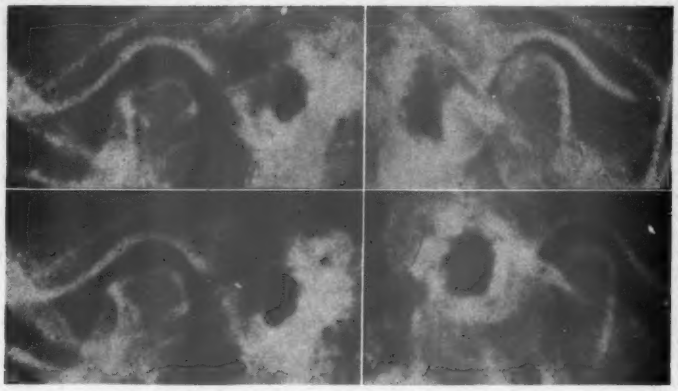

Fig. 5.—Above: Typical unilateral posterior displacement of the right condyle. Left condyle is in normal position, with some erosion or necrosis of the superior surface. The patient had had pain on the left side which had continued for about five years. It had ceased several years ago when a lower partial denture supplying molars on both sides had been made. The present symptoms consisted of pain in the right temporomandibular joint, with inability to chew or open the mouth without pain, and tenderness to pressure over the joint. Below: After restoration of the mandible to centric relation with new lower partial denture. Note position of the right condyle. Pain had disappeared

tion is attained. For some time Block[10] has advised premedication as follows: phenobarbital ½ grain three times a day, and the application of hot wet packs to the temporomandibular joint periodically for twenty-four to forty-eight hours before the visit at which bite recordings are to be made.

I long ago abandoned gothic arch tracings and all other equipment and appliances that tend to complicate, confuse or create unnecessary bulk in the operation. If the patient is relaxed and the bite plates are constructed carefully with great respect for the proper free way space when the mandible is in physiologic rest position, it is not difficult to secure centric registration by having the patient close his mouth. From there the dentist may follow his favorite technic as to other positions and movements.

Other questions which often are difficult to answer will arise. How does the dentist know when to resort to medication? If there is any doubt, some medication should be administered. Often the question can be settled on the basis of previous knowledge concerning the patient's temperament and reactions. Clonic spasm is recognized readily because the muscular twitching and quick movements are observed easily and the patient is usually aware of them. Tonic spasm is more difficult to recognize. It is of longer duration and may be almost continuous. Often there is pain, at least the patient may complain of discomfort in the face. The dentist will not be able to get the jaw relaxed and feel it drop back with a sort of thud. Careful handling of the patient, with manipulation of the jaw, may result in momentary relaxation, which is a positive indication that medication is necessary. Another valuable aid is roentgenographic examination of the temporomandibular joints.

Fortunately, there is a definite position

10. Block, L. S., Diagnosis and Treatment of Disturbances of the Temporomandibular Joint Especially in Relation to Vertical Dimension. *J.A.D.A.* 34:253 (February 15) 1947.

Fig. 6.—Left: Calcific deposit on superior surface of condyle. There had been continuous excruciating pain in and around the joint, side of face, behind the ear, and side and back of neck. Right: Fourteen months after restoration of the mandible to centric relation by closing the bite 4 to 5 mm. and by removing inlays and bridges. Note that deposit is gone from superior surface of the condyle. Pain had disappeared

of the condyle in the glenoid fossa when the mandible is in centric relation. Knowing this, there is a starting point upon which one may form opinions as to whether or not there is muscular relaxation and balance, tension or spasm. A well made roentgenogram will show whether the condyle is in the anterior or posterior part of the fossa and whether there is unilateral or bilateral displacement of the condyles (Fig. 5). This is information of tremendous importance, particularly if natural teeth are present. Much unsuccessful occlusal reconstruction has been done bilaterally when the deformities were strictly unilateral. Good roentgenograms will show whether there is condylar necrosis (Fig. 2) or degeneration or whether there are calcific deposits on the condyle (Fig. 6) which produce excruciating pain.

Centric Relation

I have been told that the Academy of Denture Prosthetists has agreed on the definition of centric relation of the mandible as being "the most retruded position of the mandible from which lateral movements can be made at a given degree of jaw separation."

In conclusion, I submit the following points which I believe to be true and fundamental:

1. To find and record centric relation of the mandible to the maxilla is one of the basic things for which we, as dentists, are striving, whether or not we are conscious of it.

2. Muscles overextended or stretched beyond their given length by certain dental procedures will return to that given length at the expense of other tissues.

3. Possibly the rest position is constant throughout life. Certainly the rest position of a given patient is stable during the time he presents himself for dental treatment and cannot be altered by any dental procedure.

4. There is a definite position of the condyle in the glenoid fossa when the mandible is in centric relation. That position is in the anterior, never in the posterior, part of the fossa. When the mandible is in its most retruded position from which lateral movements can be made at a given degree of jaw separation, the condyles should be in the anterior part of the glenoid fossa.—*Fincastle Building.*

EFFECT OF DIET ON SOME OF THE MINERALS AND VITAMINS OF HUMAN AND BOVINE MILK

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DURING the last few decades enormous advances have been made in the science of nutrition. Through nutritional research, medicine has found the answer to many of its problems. Dentistry also is looking toward the science of nutrition for the answer to its most pressing problem, the prevention of dental caries. In recent years it has been the observation of a number of investigators[1-4] that there is a close relation between nutrition and dental caries.

Milk is one of the foods most commonly used, both because of its high nutritional value and because it can be purchased fairly easily by the average American family. It is an excellent source of calcium and riboflavin, contains protein of high biologic value and is also a good source of vitamin A.

There is general agreement among pediatricians that human milk is a nearly perfect food for the nursing child. The breast-fed infant has a better chance to live and also becomes ill less frequently than the bottle-fed infant. It is to be regretted that most of the mothers of today do not want to nurse their babies. It was found that the reasons most commonly given by the mothers for not breast feeding their babies included: "lack of maternal interest; fear of pendulous breasts and unattractive physical appearance; business, home, or social duties; and the belief that bottle feeding is equal to or even superior to breast nursing."[5]

Because there is widespread misunderstanding among professional people as well as among laymen about the effects of dietary factors on the mineral and vitamin constituents of milk, this paper was written to summarize the results of recent studies of the composition of cow's milk and human milk.

Calcium and Phosphorus

Calcium and phosphorus are considered together because they are closely interrelated. Both are essential for the structure of bones and teeth. Calcium is necessary also for the normal clotting of blood and the functioning of the heart.

Adequate absorption and utilization of these two elements depend on three factors: (1) a sufficient supply of each element, (2) a suitable ratio between them and (3) the presence of vitamin D[6] (page 119). When vitamin D is absent from the diet, the assimilation of calcium

Research Associate Professor of Foods and Nutrition, Oregon State College.

1. Mellanby, M., *Diet and the Teeth: An Experimental Study.* Special Report 191. London: Medical Research Council, 1934.

2. Mellanby, M., and Pattison, C. L., Remarks on the Influence of a Cereal-Free Diet Rich in Vitamin D and Calcium on Dental Caries in Children. *Brit. M. J.* 1:507 (March 19) 1932.

3. Boyd, J. D., The Role of Diet in the Control of Dentinal Caries. *J.A.D.A.* 27:750 (May) 1940.

4. Bunting, R. W., Bacteriological, Chemical, and Nutritional Studies of Dental Caries by the Michigan Research Group; Summary. *J. D. Res.* 14:97 (April) 1934.

5. Stewart, H. L., Jr., and Pratt, J. P., Influence of Suckling Stimulus on Lactation. *West J. Surg.*, 49: 98 (February) 1941.

6. Maynard, L. A., *Animal Nutrition.* New York: McGraw-Hill Co., Inc., 1937.

and phosphorus is poor even though their ratio may be normal. On the other hand, the proper ratio between these two elements is of less importance when plenty of vitamin D is provided by the diet. Therefore, vitamin D is essential for normal bone and tooth structure because it facilitates the proper utilization of calcium and phosphorus.

When either of these elements is lacking in the diet, there is a failure of calcium-phosphorus nutrition, and normal calcification of the growing bones does not occur. This results in the deformity of the bones characteristic of rickets.

The Food and Nutrition Board of the National Research Council recommends 1.5 Gm. of calcium daily during pregnancy, 2.0 Gm. during lactation, and from 1.0 to 1.4 Gm. during growth, depending on age. For adults the daily allowance is 0.8 Gm. The daily requirements for phosphorus are met if the diet is adequate in foods rich in calcium and protein. As milk is the richest source of calcium, 1 pint of milk daily will satisfy the calcium requirements of adults. During pregnancy, lactation and growth, 1 quart of milk is necessary to supply the higher calcium needs.

For many years there has been an opinion widespread among laymen, and to some extent among professional people, that in certain parts of the country the milk is a poor source of calcium, because the cows are not fed foods rich in this element. This idea is entirely erroneous because "neither diet nor blood changes have any influence on the calcium, phosphorus, or iron content of milk"[6] (page 410). In cattle, when the intake of calcium and phosphorus is inadequate during lactation[6] (page 431):

> The bones may become so impoverished in them as to break, destroying the usefulness of the animal. In less severe situations, the bones may become progressively weakened in succeeding lactations due to incomplete restoration of the losses, and thus it becomes increasingly difficult for the animal to keep up her milk flow. The production may fall off more rapidly than normal in a given lactation, or it may fail to reach previous levels in succeeding lactations.

From the foregoing discussion it is apparent that the calcium and phosphorus content of the milk is always the same regardless of the diet of the animal. Inadequate intake of these two elements results in a decrease of milk production and impairs the general health of the animal. In Minnesota an investigation of the cause of low production of milk by cows in certain areas revealed that the hay from grasses on which the cattle were fed was deficient in phosphorus.[7] The yield of milk was increased by 50 to 146 per cent when the cows were fed adequate amounts of phosphorus. At the Florida Agricultural Experiment Station, Jersey cows whose diet was poor in calcium increased their milk yields and improved in skeletal strength after an adequate calcium intake was provided.[8]

Therefore, consideration of the composition of the feeds available is important in the feeding of animals. In order to provide a diet adequate in calcium and phosphorus, a general knowledge of the composition of different feeds is necessary because roughages and concentrates vary according to the nature of the soil in which the plants grow, the variety of species, the fertilizers used, climate, rainfall and irrigation.[9] There is also a difference in the content of the various parts of the plant.

Leafy vegetables, especially spinach, are relatively rich in calcium. But Fincke and Sherman[10] found that the calcium of spinach is not utilized well because of the

7. Eckles, C. H.; Gullickson, T. W., and Palmer, L. S., Phosphorus Deficiency in the Rations of Cattle. *Minn. Ag. Exp. Sta. Tech. Bull.* 91 (August) 1932.

8. Becker, R. B.; Neal, W. M., and Shealy, A. L., Effect of Calcium-Deficient Roughages Upon Milk Yield and Bone Strength in Cattle. *J. Dairy Sc.* 17:1 (January) 1934.

9. Beeson, K. C., *The Mineral Composition of Crops With Particular Reference to the Soils in Which They Were Grown.* A Review and Compilations. Misc. Publ. 360. U. S. Dept. of Ag., March 1941.

10. Fincke, M. L., and Sherman, H. C., The Availability of Calcium From Some Typical Foods. *J. Biol. Chem.* 110: 421 (July) 1935.

presence of oxalic acid. This, of course, does not mean that spinach should be discarded from our diet, as it is a good source of iron, vitamin A, vitamin C and riboflavin.

The opinion has been expressed by some that the growth-promoting capacity of milk is affected by pasteurization.[11] However, in a study conducted on 3,700 children between the ages of 10 months and 6 years, Frank and co-workers[12] found no significant difference in growth between the children who received pasteurized milk and those who received raw milk.

There is also an opinion general among people that if the calcium intake is inadequate during pregnancy, the incidence of tooth decay increases because the fetus obtains its calcium from the maternal stores; that is, from the bones and teeth. From this misconception there originated the old saying, "For every child a tooth." Although calcium may be withdrawn from the bones of the woman in order to meet the needs of the fetus, it cannot be withdrawn from the teeth, according to Schour,[13] as enamel and dentin are not vascular or cellular tissues. At any rate, in order to safeguard the health of the prospective mother, as well as that of her child, the daily calcium intake must be increased during pregnancy. When the ingredients necessary for the synthesis of the milk have not been provided in the daily food, the mother's output of milk may be decreased or the elements may be drawn from her body tissues, exclusive of the teeth.

Iron

The iron content of the body is not more than 3 Gm.[14] The Food and Nutrition Board of the National Research Council recommends for adults a daily intake of 12 mg. of iron. Although this is a small amount, its importance in nutrition is great. During pregnancy and growth larger amounts of iron are needed. One type of nutritional anemia is caused by a deficiency of iron. However, the feeds commonly used for farm animals contain enough iron, and consequently nutritional anemia is rare.

Both human milk and cow's milk is a poor source of iron. One quart of cow's milk contains only 2.4 mg. of it. As is the case with calcium and phosphorus, there is no way of increasing the iron content of cow's milk by feeding lactating animals increased amounts of this element. Likewise, efforts to increase the iron content of human milk by supplementing the diet of the mother with ferrum reductum have not been successful.[15] But at any rate, "the iron content of human milk and its utilization are such that nutritional anemia is much slower to develop in the breast fed baby than in the artificially fed baby when no iron supplement is given."[16]

Iodine

The iodine content of the human body is approximately 25 mg. Its principal function is in connection with the thyroid gland. Insufficient intake of iodine results in goiter, which is characterized by enlargement of the thyroid gland. There are certain areas in the United States in which, because of the condition of the soil and the water, the incidence of endemic goiter is high. The use of iodized salt has been suggested for the prevention of goiter in these areas.[17] Persons

11. Scott, E., and Erf, L. A., Ohio Tests Prove Natural Milk Is Best. *Jersey Bull. and Dairy World* 50:210 (February 11) 1931.

12. Frank, L. C., and others, Do Children Who Drink Raw Milk Thrive Better Than Children Who Drink Heated Milk? *Pub. Health Rep.* 47:1951 (September 23) 1932.

13. Schour, Isaac, Calcium Metabolism, Pregnancy and Caries. *J. Den. Children* 12:22 (first quarter) 1945.

14. Hawley, E. E., and Carden, Grace, *The Art and Science of Nutrition*. St. Louis: The C. V. Mosby Co., 1944, p. 176.

15. Wallgren, A., On the Iron Content in Milk. *Acta. paediat.* 12:153, 1932.

16. Jeans, P. C., The Feeding of Healthy Infants and Children, in *Handbook of Nutrition*. Chicago: American Medical Association, 1943, p. 339.

17. Study of the Effect of the Use of Iodized Salt on the Incidence of Goiter; First Official Report of 1935 Goiter Survey of Michigan. *J. Michigan M. Soc.* 36:647 (September) 1937.

living close to the sea do not suffer from iodine deficiency, as the sea water is relatively rich in this element. Some authors believe that the iodine content of plants depends on the condition of the soil and that animals grazing in areas in which the soil is poor in iodine may suffer from goiter.

The most practical way to prevent goiter is by feeding iodized salt, because none of the common feeds can be relied on as a rich source of iodine. The iodine content of cow's milk can be increased by feeding the animal large amounts of this element.[18] But because this is a rather expensive procedure for the average farmer, it is not practical from an economic point of view. Instead, iodized salt for the prevention of iodine deficiency is recommended for persons living in areas in which endemic goiter occurs. The main objective in feeding animals a diet high in iodine is not to produce a milk rich in this element but to prevent goiter, a condition harmful to the life of the animal.

The other mineral constituents of milk do not show any significant variation during lactation and are not affected by diet.

Vitamin A

Vitamin A is essential for the proper functioning of the epithelial cells, for growth and for the formation of healthy teeth.[19] It belongs to the fat-soluble group of vitamins, and is stored mostly in the liver. As a rule, regardless of the diet of the prospective mother during pregnancy, the store of vitamin A in the liver of the newborn child is low but increases gradually with age.[20]

The daily requirements of vitamin A differ with age. The Food and Nutrition Board of the National Research Council recommends a daily intake for adults of 5,000 international units, with an increase during pregnancy to 6,000 units and during lactation to 8,000 units.

Milk, both human and bovine, is a good source of vitamin A. The average content of a quart of cow's milk is 1,600 international units. At the beginning of lactation, human milk has five to ten times more vitamin A and its precursor, carotene, than cow's milk, but after a few days the content of both milks is the same.

The vitamin A content of cow's milk is highly variable because it depends on the kind of feed the animal consumes. The green parts of plants, as well as good pasture, are rich in carotene which is transmuted into vitamin A in the body of the animal. Therefore, there is a seasonal variation of the vitamin A content of cow's milk depending on the availability of green plants and grass.[21]

The vitamin A content of cow's milk can be increased by supplementing the daily diet of the animal with large amounts of the vitamin. When Guernsey cows were given a daily intake of 700,000 international units in the form of shark-liver oil, which contains more vitamin A than cod-liver oil, the vitamin A content of the butterfat was increased. When the daily intake was raised to 1,400,000 units, a further increase resulted. However, no effect was noted when the daily intake was 467,000 units.[22] The same results were obtained when Holstein cows were used in the experiment.[23]

The vitamin A content of human milk also is influenced by the diet. It was found that when 50,000 international

18. Matthews, N. L.; Curtis, G. M., and Meyer, J. H., The Effect of Increased Iodine Feeding Upon the Iodine Content of Cow's Milk. *J. Dairy Res.* 10: 395 (September) 1939.

19. Schour, Isaac, and Massler, Maury, The Effects of Dietary Deficiencies Upon the Oral Structures. *J.A.D.A.* 32:714 (June 1) 1945.

20. Butt, H. R., The Fat-Soluble Vitamins, in *Handbook of Nutrition*. Chicago: American Medical Association, 1943, p. 185.

21. Dornbush, A. C.; Peterson, W. H., and Olson, F. R., The Carotene and Vitamin A Content of Market Milks. *J.A.M.A.* 114:1748 (May 4) 1940.

22. Deuel, H. J., Jr., and others, The Production of a High Vitamin A Milk by Diet. *J. Nutrition* 22:309 (September) 1941.

23. Deuel, H. J., Jr., and others, The Effect of a High Vitamin A Intake on the Blood and Milk Carotene of Holstein and Guernsey Cows. *J. Nutrition* 23:367 (June) 1942.

units of vitamin A were given daily, starting with the sixth month of pregnancy, there was a significant increase of vitamin A in the early milk.[24] When the daily intake was raised to 100,000 units, the vitamin A content of the milk was doubled. This high content could be maintained throughout the lactating period by continuing the supply of the vitamin. A further increase was noted when the daily intake was raised to 200,000 units. However, small amounts of vitamin A given daily as a supplement to a well balanced diet do not have any effect on the content of this vitamin in the milk.[25] The irradiation of milk with ultraviolet rays for the production of 400 U.S.P. units of vitamin D a quart, does not change the vitamin A and carotene content of milk.[26] Moreover, the vitamin A and carotene content of evaporated milk remains unchanged during the processing and shows no decrease at the end of a year's storage.[27]

Vitamin D

Vitamin D belongs to the fat-soluble group of vitamins. It is essential for normal growth of bones and teeth. The requirements of vitamin D for adults have not been determined accurately, but the Food and Nutrition Board of the National Research Council recommends 400 to 800 international units during pregnancy, lactation and growth.

The foods which contain vitamin D are few. Cod-liver oil and other fish-liver oils are rich in vitamin D. Neither human nor bovine milk contains enough vitamin D to protect the baby against rickets. For this reason, cow's milk has been enriched with vitamin D by irradiating the milk, by feeding the animal irradiated yeast or by direct addition of a cod-liver concentrate.[28] There is a seasonal variation in the content of vitamin D in cow's milk. In summer larger quantities are present because the animals are exposed to more sunshine, which is the main factor in the production of vitamin D of milk.[29, 30]

When the fodder of the cow is supplemented with irradiated yeast, the vitamin D content of the milk is high enough to prevent the development of rickets in infants.[31] On the other hand, the milk of a woman whose otherwise excellent daily diet was supplemented during pregnancy and lactation with 2 quarts of milk fortified with 300 units of vitamin D concentrate of cod-liver oil was not high enough in vitamin D to heal rickets in 3 breast-fed infants, although her breast-fed baby did not show any symptoms of this disease.[32] Ultraviolet irradiation of the mother during the lactating period is also effective in increasing the antirachitic properties of her milk.[33]

Vitamin C

Vitamin C belongs to the water-soluble group of vitamins. Deficiency of ascorbic acid results in scurvy, which can be demonstrated only in man, the guinea pig and the monkey. The other species

24. Hrubetz, M. C.; Deuel, H. J., Jr., and Hanley, B. J., Studies on Carotenoid Metabolism; The Effect of a High Vitamin A Intake on the Composition of Human Milk. *J. Nutrition* 29:245 (April) 1945.

25. McCosh, S. S., and others, Human Milk Studies; Vitamin Potency as Influenced by Supplementing the Maternal Diet with Vitamin A. *J. Nutrition* 7:331 (March) 1934.

26. Fuhr, L.; Dornbush, A. C., and Peterson, W. H., The Effect of Ultraviolet Irradiation on the Vitamin A, Carotene and Riboflavin Content of Milk. *J. Dairy Sc.* 26:643 (July) 1943.

27. Henry, K. M., and others, The Effect of Commercial Drying and Evaporation on the Nutritive Properties of Milk. *J. Dairy Res.* 10:272 (May) 1939.

28. Kraus, W. E., and Bethke, R. M., New Developments in the Field of Vitamin D Milk. *Ohio Ag. Exp. Sta., Bimonthly Bull.* 184 (January-February) 1937.

29. Bechtel, H. E., and Hoppert, C. A., A Study of the Seasonal Variation of Vitamin D in Normal Cow's Milk. *J. Nutrition* 11:537 (June) 1936.

30. Campion, J. E., and others, The Source of Vitamin D in Summer Milk. *Biochem. J.* 31:81 (January) 1937.

31. Hess, A. F., and others, Antirachitic Potency of the Milk of Cows Fed Irradiated Yeast or Ergosterol; Clinical Test. *J.A.M.A.* 97:370 (August 8) 1931.

32. Barnes, D. J., and others, Human Milk Studies; Vitamin D Potency as Influenced by Supplementing the Diet of the Mother During Pregnancy and Lactation With Cow's Milk Fortified With a Concentrate of Cod Liver Oil (Test on Rachitic Infants and Rats). *J. Nutrition* 8:647 (December) 1934.

33. Hess, A. F.; Weinstock, M., and Sherman, E., Antirachitic Properties Developed in Human Milk by Irradiating the Mother. *J.A.M.A.* 88:24 (January 1) 1927.

which have been studied either have the ability to synthesize the vitamin in their bodies or do not require it at all.

The recommended daily allowance of vitamin C differs with age, and is higher during growth, pregnancy and lactation. The Food and Nutrition Board of the National Research Council recommends a daily intake for adults of 70 to 75 mg. During pregnancy the allowance is 100 mg. and during lactation 150 mg.

Human milk is a better source of ascorbic acid than commercial cow's milk. "A pint of commercial milk contains from 4 to 17 mg. of vitamin C; the same amount of mother's milk contains 22 to 57 mg."[34] The vitamin C content of human milk can be increased by supplementing the diet of the mother with large quantities of the vitamin.[35]

The cow has the ability to synthesize its own vitamin C, and the diet of the lactating animal does not affect the vitamin C content of the milk.[36] However, the stage of lactation has some effect on the amount of vitamin C in the milk, and there is also a slight difference in the vitamin C content of milk from cows of different breeds.[37] Moreover, the ascorbic acid content of cow's milk is variable. By the time the milk reaches the consumer, it has lost the greatest portion of its initial vitamin C, the decrease being caused by the methods of processing milk.[38]

Riboflavin

Riboflavin belongs to the water-soluble group of vitamins. The Food and Nutrition Board of the National Research Council recommends a daily intake of 1.6 mg. for adults. During pregnancy and lactation, the daily requirements are 2.5 mg. and 3.0 mg., respectively.

Milk is an excellent source of riboflavin. Although the riboflavin content of cow's milk varies with the diet of the animal,[39] a quart of market milk contains about 1.7 mg., which is enough to meet the daily needs of an adult. Human milk contains less than cow's milk.[40, 41]

Direct exposure of cow's milk to sunlight results in a serious loss of riboflavin content. It was found that after bottles of milk were exposed for two hours to direct sunlight, as much as 40 per cent of the riboflavin was destroyed.[42] On the other hand, processing of milk does not influence its riboflavin content.[43]

For many years there has been a tendency to prepare commercial milk fortified with several vitamins and minerals. Such a product has not been approved by the Council on Foods and Nutrition of the American Medical Association. This council approves the addition of vitamin D, but believes that the fortification of milk with vitamin A, thiamine, niacin, riboflavin, iron and iodine is not in the interest of public health.[44]

Summary

A review of the literature is made in regard to the effect of diet on certain minerals and vitamins of bovine and human milk.

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36. Riddell, W. H., and others, Influence of the Ration on the Vitamin C Content of Milk. *J. Nutrition* 11:47 (January) 1936.
37. Rasmussen, R., and others, The Effects of Breed Characteristics and Stages of Lactation on the Vitamin C (Ascorbic Acid) Content of Cow's Milk. *J. Nutrition* 11:425 (May) 1936.
38. Hawley, E. E., Vitamin C Content of Milks: Raw, Pasteurized, and Baby Formulae. *J. Am. Dietet. A.* 14:275 (April) 1938.
39. Johnson, P.; Maynard, L. A., and Loosli, J. K., The Riboflavin Content of Milk as Influenced by the Diet. *J. Dairy Sc.* 24:57 (January) 1941.
40. Roderuck, C. E., and others, Human Milk Studies; Free and Total Riboflavin Contents of Colostrum and Mature Human Milk. *Am. J. Dis. Child.* 70:171 (September) 1945.
41. Lawrence, J. M.; Herrington, B. L., and Maynard, L. A., Human Milk Studies; Comparative Values of Bovine and Human Milks in Infant Feeding. *Am. J. Dis. Child.* 70:193 (September) 1945.
42. Stamberg, O. E., and Theophilus, D. R., Photolysis of Riboflavin in Milk. *J. Dairy Sc.* 28:269 (April) 1945.
43. Theophilus, D. R., and Stamberg, O. E., The Influence of Breed, Feed, and Processing on the Riboflavin Content of Milk. *J. Dairy Sc.* 28:259 (April) 1945.
44. Fortification of Milk With Vitamins and Minerals; Report of the Council on Foods and Nutrition. *J.A.M.A.* 126:432 (October 14) 1944.

The calcium, phosphorus and iron contents of milk are not affected by diet.

The iodine content of cow's milk can be increased by feeding the animal large quantities of the element, but this procedure is expensive and not practical. For the prevention of endemic goiter, the use of iodized salt is recommended.

The vitamin A content of human and bovine milk is affected by diet.

Both human and bovine milks are poor sources of vitamin D. Cow's milk contains more of this vitamin during summer, and it also can be enriched by irradiation, by feeding the animal irradiated yeast or by direct addition of a cod-liver concentrate. Ultraviolet irradiation of the mother during lactation is effective in increasing the antirachitic properties of her milk.

The vitamin C content of human milk can be affected by the diet. The cow has the ability to synthesize its own vitamin C, and the diet has no effect on the amount secreted in the milk. Methods of processing reduce considerably the vitamin C content of cow's milk.

The diet of the cow influences the riboflavin content of the milk to a certain extent, but cow's milk remains one of the best sources of this vitamin. Exposure to sunlight destroys much of the milk's riboflavin content.

With the exception of vitamin D, fortification of commercial milk with minerals and vitamins is not recommended.

Dental Knowledge From Athropology.—In 1931 Sir Arthur Keith in his foreword to Professor Middleton Shaw's book on the dentition of the South African Bantu, said:

"The greater part of the world still remains in a state of dental darkness. Even in Europe and America much still remains to be done to complete a preliminary survey of the mouths of mankind. . . . Teeth are key structures—providing clues to race and to bodily health. Our knowledge of man's past has to be based very largely on a study of fossil teeth and jaws. . . . Teeth are more susceptible than other structures of the body to the changes which are produced by civilization. . . . We cannot know too much about teeth."

In 1947 we have not gone much further than when these words were written. We have still many lessons to learn from the study of dental conditions in primitive peoples all over the world.—*P. O. Pedersen, "Dental Investigations of Greenland Eskimos (Summary)," Proc. Roy. Soc. Med. (Sect. Odont.) 40:726, October 1947.*

SEDIMENTATION RATES IN PERIODONTAL DISEASE: CHANGES IN RATES AFTER SURGICAL TREATMENT

Henry Clay Veatch, M.D., D.D.S., and John K. Young, D.D.S., San Francisco

FAHRAEUS showed that if a sample of human blood is prevented from clotting by adding sodium citrate to it, the rate of sinking, that is, the sedimentation rate, of the red cells varies in disease and under certain conditions in health.[1] In women during pregnancy and also during menstruation and in patients with certain pathologic states, the sinking rate of the red cells is found to be increased markedly. The pathologic states which cause the greatest increase in the rate are septicemia, pulmonary tuberculosis, anemia, malignant tumors, pelvic inflammatory disease and diabetes.[1] It has been stated that an increased rate may occur in the presence of any condition that is marked by tissue disintegration and infection.[2] The nonspecificity of the test is obvious; however, determinations of the sedimentation rate are of value in gaging the degree of activity of an infectious process. Under certain conditions, when the sedimentation rate has returned to normal, it may be safe to say that infection is quiescent.[1]

Purpose of Investigation

The over-all purpose of this investigation was to determine whether or not the sedimentation test would be useful in evaluating the results of treatment of periodontal disease. An attempt was made to determine (1) whether inflammatory periodontal disease (marginal periodontitis) is accompanied by an increased sedimentation rate, and (2) whether a patient with an increased sedimentation rate will show a decrease in rate after surgical treatment (gingivectomy with removal of septal bone when involved) of the periodontal condition.

Materials and Methods

Various methods of determining the sedimentation rate were investigated: Rourke-Ernstene,[3] Westergren,[4] Cutler[5] and Landau.[6] The micro-sedimentation method of Landau[6] and the Cutler finger puncture method[5] were employed in this work. The results of the tests were tabulated on Cutler blood sedimentation charts. A case history was taken on each patient in order to determine the presence of any condition other than the periodontal disease which might be responsible for any increased sedimentation rate present before treatment. A sedimentation rate determination then was made before treatment, and a second test was made approximately a month after completion of treatment.

One hundred and four cases were in-

This research was financed in part through funds contributed by the Council on Dental Therapeutics of the American Dental Association.

From the Departments of Oral Surgery and Bacteriology and Pathology of the College of Physicians and Surgeons, School of Dentistry, San Francisco.

1. Best, C. H., and Taylor, N. B., *The Physiological Basis of Medical Practice*. Baltimore: William Wood and Company, 1943, p. 84.

2. Kilduffe, R. A., *The Clinical Interpretation of Blood Examinations*. Philadelphia: Lea & Febiger, 1931, p. 114.

3. Rourke, M. Dorothy, and Ernstene, A. C., Method for Correcting Erythrocyte Sedimentation Rate for Variations in Cell Volume Percentage of Blood. *J. Clin. Investigation* 8:543 (June) 1930.

4. Westergren, A., On Stabilitary Reaction of Blood in Pulmonary Tuberculosis. *Brit. J. Tuberc.* 15:72 (April) 1921.

5. Cutler, J., Finger Puncture Method for Blood Sedimentation Test. *Am. J. M. Sc.* 173:687 (May) 1927.

6. Landau, Albin, Microsedimentation (Linzenmeier-Raunert Method). *Am. J. Dis. Child.* 45:691 (April) 1933.

Sedimentation rates

Description	Cases		
Marginal periodontitis prior to gingivectomy	104		
No evidence of disease other than periodontitis	71		
Normal sedimentation rate		65	
Slight or moderate increase in sedimentation rate		6	
Systemic diseases in addition to periodontitis	33		
Borderline sedimentation rate (7 to 10 mm. an hour). Minor systemic diseases		17	
Slight or moderate increase in sedimentation rate. Systemic diseases		16	
Marginal periodontitis one month after gingivectomy	73		
No change in sedimentation rate (all within normal limits both before and after operation	40		
Changes in sedimentation rate	33		
Increases in sedimentation rate		17	
Within normal range both before and after operation			9
Above normal levels (systemic disease, 4 cases; apparently free from systemic disease, 4 cases)			8
Decreases in sedimentation rate		16	
Within normal ranges both before and after operation			6
Decreases in rate from 3 to 9 mm. an hour (reading dropped from borderline or pathologic levels to normal levels, 7 cases; reading dropped but remained above normal levels, with history of arthritis, 3 cases)			10

vestigated. Of these, 73 were carried to completion. Thirty-one patients failed to return for the second determination of the sedimentation rate.

Observations

In the 104 cases investigated, there were normal sedimentation rates ranging from 1 to 7 mm. an hour in 65 cases (see table). None of these patients was known to be suffering from any systemic condition, normal or pathologic, associated with an increased sedimentation rate. All showed clinical and roentgenographic evidence of periodontal disease. In 17 cases there were borderline sedimentation rates ranging from 7 to 10 mm. an hour. None of these patients was known to have any of the systemic conditions contributing to marked increases in sedimentation rate. There were in this group, however, cases of tonsillitis, sinusitis, thyroid deficiency, gastro-intestinal disorder and so forth.

In 14 cases there were slight increases in sedimentation rate ranging from 11 to 15 mm. an hour, and in 8 cases there were moderate increases in rate ranging from 15 to 23 mm. an hour. Of these 22 patients who had either slight or moderate increases in sedimentation rate, all but 6 were known to be suffering from systemic involvements (arthritis, rheumatism, syphilis, pregnancy, and so forth) which would account for the increased sedimentation rates.

Of the 73 patients who returned for a second determination of the sedimentation rate a month after the completion of the periodontal operation, 40 showed a difference of 2 mm. or less between the first and second tests. Seventeen showed increases ranging from 2.5 to 14.0 mm., and 16 showed decreases of from 2.5 to 9.0 mm. All 40 patients who had a change in sedimentation rate of 2 mm. or less had rates that were within a normal range (1 to 8 mm. an hour) both before and after surgical intervention.

Of the 17 patients who showed increases in rate of from 2.5 to 14.0 mm., 9 had rates that were within the range of normality both before and after operation. The remaining 8 showed increases of from 4 to 14 mm., with the reading of the second test definitely more than the normal or borderline level. Four of these patients had systemic conditions associated with increased sedimentation rates; the other 4 presented no evidence of systemic disorder.

Of the 16 patients who showed decreases of from 2.5 to 9.0 mm. in the sedimentation rate after surgical intervention, 6 were in the range of normality both before and after operation. The remaining 10 showed decreases of from 3 to 9 mm., bringing the reading from a borderline or pathologic position to a normal reading in all but 3 cases in which the second readings were still more than the normal levels. In each of these 3 cases there was a history of arthritis.

Conclusions

Of the 104 patients with periodontal disease who were investigated, 71 were apparently free from systemic conditions influencing the sedimentation rate. Of these, 65 cases (91 per cent) were normal in relation to the sedimentation rate. Therefore, it may be concluded that although periodontal disease often is associated with infection and tissue disintegration, it does not appreciably influence the sedimentation rate of the red blood cells.

In 40 of 73 cases (55 per cent) there was little or no change in the sedimentation rate of the red blood cells a month after surgical treatment of the periodontal condition. Of the remaining 33 (45 per cent) about half showed a rise in sedimentation rate; the other half showed a decline. Therefore it may be concluded that surgical intervention usually has little or no effect on the sedimentation rate of the red blood cells but may cause a slight or moderate rise or decline in rate.

In view of these results it may be concluded that determination of the sedimentation rate is not a reliable measure of progress in the treatment of periodontal disease.

The data on blood sedimentation rates obtained in this investigation were examined by the Statistical Laboratory of the Department of Mathematics of the University of California. This examination revealed no statistically significant evidence of a reduction in sedimentation rate after surgical treatment of periodontal disease.—*870 Market Street.*

Methods of Disinfecting Instruments.—All solutions for the disinfection of dental and surgical instruments have marked limitations. The sterilization modality, in order of preference, all other things being equal is: (1) steam under pressure, (2) boiling water, and (3) chemicals. All instruments should be carefully washed with soap and water and rinsed before subjecting them to the disinfectant process. The mechanical removal of bacteria is significant, and is particularly desirable in the presence of blood, pus, or other organic matter.—*Accepted Dental Remedies, edition 14, page 94.*

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EDITORIALS

DR. ROSCOE H. VOLLAND RETIRES AFTER TWENTY YEARS AS TREASURER

ROSCOE H. VOLLAND, treasurer of the Association since 1928, has been compelled, by physician's orders, to retire. Only those who have been intimately acquainted with the administrative affairs of the Association can appreciate fully the many contributions which he, as treasurer, has made to the profession. Quiet, unassuming and meticulous, he gave to the office of treasurer the same exacting attention which he devoted to his lifelong specialty, operative dentistry.

One of the inherent qualities which fitted him well for the position of treasurer was his ability to select and purchase for the Association sound securities at an opportune time and dispose of them later on a rising market. As a result, the portfolio of the Association, particularly during the depression years, consistently showed a substantial profit, whereas portfolios of many other organizations, including some banking institutions, suffered severe losses.

A champion of economy, he steadfastly adhered to the principle that the Association should always function within its income, a principle which he fought for constantly and successfully until postwar inflation, unaccompanied by an increase in dues, made such a course impossible.

During his term of office the Association, for manifold reasons, experienced a magnificent growth and development. During that period the Association doubled its membership and doubled its resources. Dr. Volland was privileged to play an important part in these developments.

Fortunately for dentistry, Dr. Volland, in resigning as treasurer, will not dissociate himself from Association affairs. He continues to serve as a member of the Council on Research, which position he has held since 1913. Dr. Volland is succeeded by H. B. Washburn, immediate past-president, who assumed the office of treasurer at the close of the eighty-ninth session of the Association.

HOUSE OF DELEGATES URGES ADMINISTRATIVE PARITY FOR ARMY DENTAL CORPS

THE need for improving the status of dentistry in the Army is plain. It has been plain ever since the Dental Corps was established in 1901, but the flagrant administrative inequalities of World War II were required in order to focus national attention on the unjust conditions under which Army dental officers must serve their country. The complaints and criticisms of those who served in the Dental Corps during the late war are so numerous and caustic that they can no longer be attributed to the unusual pressures engendered by war. They can no longer be ignored by Army officials. They can be condoned no longer by the dental profession.

The almost universal complaint arising from dental officers is a simple one. Dental officers charged with the responsibility for maintaining the dental health of military personnel are not given the authority to carry out that responsibility. Final authority for dental care in the Army rests with those untrained in dentistry and unfamiliar with dental problems. This indefensible administrative pattern tends strongly to lower the standards of dental service and to decrease the morale of the officers of the Dental Corps.

Two methods have been proposed to bring about a much-needed improvement. The first urges "complete autonomy": the complete separation of the Dental Corps from the medical service. The second seeks to retain the Dental Corps as an integral part of the Medical Department but to give the Dental Corps administrative parity with the Medical Corps. The House of Delegates, at its recent session, urged that efforts be made to obtain parity of administration in all branches of the armed forces. It directed the Council on Legislation to seek Congressional action which will give all government dental corps the authority to operate under a program of administrative parity with that of the medical corps.

The House of Delegates followed a traditional pattern in dentistry by urging "administrative parity" rather than "complete autonomy." Dentistry is an important part of a general health service and it should not be separated entirely from medicine. The interrelation of oral health and general health is so well known that every effort must be made to bring about closer cooperation between the dental and medical professions. This closer relationship can be effected in the Army by administrative parity and without impairing the close medical-dental relations that are essential for the welfare of the patient.

Dentistry does not question the right of medicine to administer and control Army medical services. It does question the right of medicine to administer dental affairs. Not until administrative parity is granted the Dental Corps will the health services of the Army function efficiently. On numerous occasions, representatives of the Association have pointed out this seemingly simple fact to Army officials and have requested the proper integration of the dental service with the medical service. These requests have been denied, usually on the ground that there was no cause for complaint or that "Army regulations" forbade any effort at improvement. The responsibility for the denial of parity rests heavily with the members of the Medical Corps

and with the officers of the Dental Corps. Such an attitude on the part of the medical officers is inexplicable since members of the Army Medical Corps protest bitterly that certain rights of administration are withheld from them by the general staff. Under what logical argument, then, can the Medical Corps withhold from the Dental Corps the authority which it needs to administer dental affairs effectively?

On September 27,[1] the Army Medical Department, forced by increasing interest on the part of legislators and by its failure to secure enough dental personnel for a precarious peacetime existence, recognized dentistry's claims by issuing revised regulations governing its dental service. It remains to be seen whether this is a real gesture in the right direction or another token of appeasement for those who have been critical of the Army Dental Corps. "The Association has little confidence that changes in regulations can be effective if they are unsupported by legislation."[2]

The Association will intensify its efforts to secure legislation that will improve the status of dentistry in the Army. It is hoped that these efforts will have the cooperation of Army medical and dental officers, but if such cooperation is withheld the Association will present its claims to Congress, as the citizens of this country have a right to know why efficient dental service is being arbitrarily withheld from their sons and daughters who have been called into service. The perquisites and traditions of any Army group can not be permitted to block any longer the desire of a health profession to serve its country well—in both peace and war.

1. Army regulations No. 40-15, Department of the Army, Medical Department, Dental Corps-General Provisions, September 27, 1948.
2. Washburn, H. B., Statement made at meeting with Army officials, Washington, D. C., August 8-9, 1948.

COUNCIL ON LEGISLATION

DR. FLAGSTAD COMMENTS ON STATEMENT OF THE NATIONAL COMMITTEE OF DENTISTS

CARL O. FLAGSTAD, chairman of the Council on Legislation, has replied to a statement made by the National Committee of Dentists in connection with the resolution recently adopted by the House of Delegates. The resolution, published in the October issue of THE JOURNAL,* places the Association on record as "opposing the policies and methods" used by the N.C.D.

The N.C.D. statement was sent throughout the country on September 24 in a bulletin which sought further financial aid from dentists. Generally, the statement attempts, by implication, to interpret the A.D.A. resolution as favoring compulsory health insurance, and socialization. The paragraph from the N.C.D. statement, which is the chief subject of Dr. Flagstad's remarks, follows:

> "The Resolution states that the House of Delegates formally reiterates its established policy of opposing a system of Federal Compulsory Health Insurance. There can be no question of the sincerity of the individual members of the House of Delegates in their opposition to Compulsory Health Insurance. However, it is of record —the Congressional Record—that James E. Murray (co-sponsor of the Wagner - Murray - Dingell Bills), Senator from Montana, is considered in effect the Washington legislative agent of the A.D.A. operating group. Senator Murray has introduced in the Senate practically all of the bills submitted by its Legislative Committee (now the Council on Legislation)."

Dr. Flagstad's reply was sent October 4 to Dr. A. P. Williams, of Louisville, Ky., chairman of the N.C.D. which is an affiliate of the National Physicians Committee with offices at 75 East Wacker Drive, Chicago. Most of the text of that reply follows:

"I have purposely endeavored to keep from being drawn into the controversy which has been going on over the activity of the National Committee of Dentists, sometimes under very trying circumstances. However, I can't let this article pass without voicing my objections as it is a gross misstatement of facts. It is unfair to the American Dental Association, and especially the Committee on Legislation for they are the 'operating group.'

"I would appreciate receiving from the National Committee of Dentists a copy of the Congressional Record which lists the statement 'that Senator James E. Murray, from Montana, is considered in effect the Washington legislative agent of

*See page 471.

the American Dental Association operating group.' I further would like to have the facts to substantiate the statement, 'Senator Murray has introduced in the Senate practically all of the bills submitted by its Legislative Committee.' The fact of the matter is that the only legislation Senator Murray has fostered in the Senate for the American Dental Association is the Dental Research Bill. There were two important reasons for selecting him for this sponsorship:

"1. Senator Murray was in sympathy with the objectives of the Dental Research Bill; 2. and more important, he was chairman of the powerful Labor and Public Welfare Committee during the long Democratic leadership in the Senate and the Dental Research Bill was to be assigned to that committee.

"Men who have worked with legislation will readily understand that for the successful prosecution of legislation it is a splendid beginning on the long road to enactment to have it sponsored by the chairman of the committee which will have the bill in charge when it reaches Congress. This immediately assures favorable consideration by the committee. That this strategy worked out successfully is attested by the fact that under Senator Murray's sponsorship the Dental Research Bill passed the Senate on three different occasions, while in the House it failed to move even in the committee which had the bill in charge.

"At the time the Committee on Legislation was preparing for introduction of legislation into the 80th Congress, Senator Taft, who represents the opposite in health legislation from Murray, of his own volition suggested in an interview that he was willing to join with Senator Murray on the sponsorship of the Dental Research Bill. This was done and was highly important as Senator Taft was then chairman of the Committee on Labor and Public Welfare.

"You will recall the bill readily passed the Senate, but in the House, because of political reasons, it was necessary to secure a Republican champion for the bill and Representative Walter E. Brehm, of Ohio, came to our aid. In the final analysis, Senator Murray's bill was side-tracked and Congressman Brehm's bill was enacted.

"I have frequently overlooked criticisms which have come to the Legislative Committee and have charged them to ignorance of legislative procedure on the part of the critic. However, it is difficult to excuse, on such grounds, the leadership of an organization whose business it is to follow legislation. The insinuations contained in the paragraph in question (printed above from the N.C.D. statement) and in the letter (the N.C.D. circular letter) are unfounded and resented by the chairman of the Committee on Legislation. Senator Murray certainly is not in any doubt concerning the American Dental Association's position on compulsory health insurance. In the testimony of the American Dental Association at the hearings on the Wagner Bill and the National Health Bill, the witnesses for the Committee on Legislation emphasized repeatedly the policy of the American Dental Association. It is a matter of record in those hearings that our answers to Senator Murray's questions on this subject are direct, positive and uncompromising. It is true that in all our relations with Congress or members of Congress, or federal agencies, no matter how violently we have differed, the Committee on Legislation has always accorded them the highest respect and conducted itself with dignity in every situation.

"Perhaps to some this might be weakness; to me it is strength and in the final analysis has brought results and respect to the American Dental Association in Congressional circles.

"The Committee on Legislation's objective is to foster federal legislation which is in the interest of public and

professional welfare and to oppose federal legislation which in the opinion of the American Dental Association is detrimental to the health welfare of our people. Today this is a big business and the Committee has neither any desire nor time to waste in useless quarreling and, therefore, the chairman has consistently refused to participate in the present controversy. The Committee covets the good will and sympathetic understanding of every member of the American Dental Association for frequently Congressional situations arise when we sorely need it. It is unfortunate the circular letter contains these misstatements for it may have a tendency to weaken the Association's confidence in the Committee and it has made it necessary for me to challenge them."

COUNCIL ON DENTAL THERAPEUTICS

PRELIMINARY COMMENTS ON DENTAL PRODUCTS

In order to provide helpful information promptly, the Council on Dental Therapeutics has authorized the publication of preliminary comments concerning commercial preparations which are within its scope. The comments are limited to clear-cut facts and references to previously published information and written opinions. The Council will authorize the publication of comprehensive status reports at a future time if they appear to be needed and will accept those products which, on investigation, are found to be eligible for inclusion in *Accepted Dental Remedies* in accordance with its rules.

The products listed below have not been accepted by the Council.

Formula 19 Tooth Paste

ViViBx Formula 19 Tooth Paste: This product is stated to contain calcium phosphate, fluorine, chlorophyll and dibasic ammonium phosphate.

Among the advertising claims are such statements as ". . . Formula No. 19 —Helps Prevent Tooth Decay . . .", ". . . the first toothpaste to correct the causes of external tooth decay . . .", "... chlorophyll for hygienic and purifying action . . .", ". . . . fluorine hardens teeth and delays decay . . ." and *"New* Discovery Helps Prevent Tooth Decay."

The distributor of Formula 19 Tooth Paste has been invited to submit any evidence which is available to support the claims made for the product. No evidence has been received from the firm or from any other source concerning the safety or effectiveness of the product.

The reader may wish to refer to recent publications for information relative to the dental and oral effects of dibasic ammonium phosphate[1,2] and

1. Kesel, R. G., and others, The Biological Production and Therapeutic Use of Ammonia in the Oral Cavity in Relation to Dental Caries Prevention. *J.A.D.A.* 33:695 (June 1) 1946.

2. Kesel, R. G., and others, Ammonia Production in the Oral Cavity and the Use of Ammonium Salts for the Control of Dental Caries. *Am. J. Orthodont. & Oral Surg.* 33:Sec. Oral Surg. 80 (February) 1947.

fluorine preparations.[3-5] Calcium phosphate is an abrasive commonly used in dentifrices. The Council has not recognized any claims for its therapeutic value when it is used as a dentifrice ingredient. The status of chlorophyll in dental therapeutics is undetermined.

Ce-De-Flor

CeDeFlor Tablets (Haack's C D F): Each tablet is stated to contain calcium fluoride, 3 mg.; vitamin C, 30 mg., and vitamin D, 1000 units. The product is claimed to inhibit dental caries, but its usefulness in dentistry has not been established.[5, 6]

Enziflur

Enziflur Lozenges: Each lozenge is stated to contain calcium fluoride, 2 mg.; ascorbic acid, 30 mg., and vitamin D, 400 units. The product is advertised as an aid in the prevention of dental caries, but its usefulness in dentistry has not been established.[5, 6, 7]

Gingisol

Dr. Barben's Gingisol: An amber liquid with a phenolic odor. According to the label, it contains potassium hydroxide; phenol, less than 1 per cent; and flavors. It is labeled as an astringent. A sample of the product was found to have a pH value of 9.0 at 23 C.

A newspaper advertisement submitted by the Better Business Bureau of Atlanta, Ga., refers to the product as ". . . an amazing remedy developed by a practicing dentist especially for soft, spongy, bleeding gums and Pyorrhea. . . . You may use it with complete confidence." Neither the label nor the advertisement directs the reader to visit his dentist.

The Council has not accepted any solutions of phenol for use in the treatment of periodontal disease. Adequate professional care and instructed oral hygiene are the only means of treatment known to be effective. Exclusive reliance on medication tends to permit the ravages of periodontal disease to become serious.

Lorakon

Lorakon Collutory: Stated to contain benzalkonium chloride (1:4,000) and glycerin in an aromatized, slightly alkaline, aqueous vehicle. A collutory is defined in a widely used medical dictionary[8] as "a wash; chiefly a mouth wash or gargle." The properties of benzalkonium chloride, which is a germicide listed in the *U. S. Pharmacopeia,* are discussed in *Accepted Dental Remedies.*[9]

It is claimed that Lorakon is deodorizing and antiseptic. Evidence to show that these effects are of more than transient clinical significance is not available. For a detailed discussion of this subject, see the chapter on mouth washes in *Accepted Dental Remedies.*[10]

3. *A.D.R.,* ed. 14, p. 70.

4. The Role of Fluorine in Dental Caries: Synthetic Fluoride Tablets and Bone Meal Preparations. Editorial *J.A.D.A.* 34:345 (March 1) 1947.

5. Fluorides: Questions and Answers. *J.A.D.A.* 36: 389 (March) 1948.

6. Council Announces Decision on Synthetic Fluoride Tablets. *J.A.D.A.* 34:213 (February 1) 1947.

7. Bibby, B. G., Fluoride Mouthwashes, Fluoride Dentifrices, and Other Uses of Fluorides in Control of Caries. *J. D. Res.* 27:367 (June) 1948.

8. Dorland, W. A. Newman, *The American Illustrated Medical Dictionary,* ed. 21. Philadelphia: W. B. Saunders Company, 1947, p. 344.

9. *A.D.R.,* ed. 14, p. 95.

10. *A.D.R.,* ed. 14, p. 131.

INTERNATIONAL CORRESPONDENCE

News from Great Britain

The effects of nationalized dentistry are becoming clearer in England and the present supply of dentists is running far short of the increased demand for treatment.

After almost four months of operation under the National Health Service wherein dental and medical treatment is paid for by the government, dentists report they are working harder than ever before and putting in additional hours at their offices daily.

At the outset of the system, in July, British dentists reported comparatively few patients requesting treatment under the "cradle-to-grave" plan set up by Health Minister Aneurin Bevin. But when the worker's weekly pay deduction of four shillings and eleven pence went into effect, the traffic increased and has continued to climb.

Today appointment books are filled for weeks in advance for nearly all the "service dentists" and those who do not keep stipulated appointments are swamped. One dentist reported that after closing his door at 6 p.m. it took until after 10 p.m. to treat the patients who had crowded into the waiting room. This condition is most common in the industrial districts.

The demand for additional dentists to assist in these practices also has created a problem for the School Dental Service which cannot meet the salaries that are being offered by practitioners.

Generally, dentists operating under the National Health Service System are streamlining their office procedures and hiring lay help. Dental mechanics and apprentices are in demand.

Abuses of the system by the "get-something-for-nothing-while-it-lasts" group of patients have been noted but the nucleus of steady patients who sought regular dental treatment before the "free" service continue to be the backbone of the average practice.

Among the newer classes to seek treatment are housewives and adolescents who were not covered in the old national health insurance scheme.

Many dentists also have noted that a few 80-year olds who have been edentulous for years and who never have had dentures are seeking help. Others who have had dentures but gave up wearing them because they did not fit are coming in for new sets.

Even with this large increase in patients, however, the "service dentist" still must gross about £4,000 a year to clear the £2,000 listed by the Spens Committee as an adequate yearly profit. Consequently, the rumors of fortunes being made by these dentists appear to be exaggerated.

Payment for services by the government is reported as prompt with only scattered complaints and in some of the districts, particularly in the agricultural north, many dentists are remaining out of the system as recommended by the British Dental Association. Some of these men report they are losing money while others claim their practices have not suffered at all.—*John R. Boyes, Newcastle Upon Tyne, England.*

News From Argentina

A number of dentists in private practice have announced plans to devote three hours each day to giving free dental attention to school children in their respective areas. This "social school dentist" plan was evolved by the National Health Department. The dentists who participate in the plan will receive a fixed stipend from the government for their time and work.

The Argentine government, through this plan, hopes to avoid the necessity of installing and maintaining hundreds of public dental clinics.—*David M. Cohen, Casilla de Correo 2047, Buenos Aires, Argentina.*

THE NATIONAL SCENE

from the Journal's Washington Correspondent

Whether the United States Senate shall number a member of the dental profession on its rolls is being decided in the national elections this month. Although public attention has been focussed on more profound aspects of the many political contests now at or just past the climactic stage, dentistry may well take particular interest in Wyoming's 1948 Senatorial race. By the time this appears in print, the contest probably will have been settled and a voters' choice made between the Republican incumbent, Senator Edward V. Robertson, and the dentist-Governor who aspires to a Senate seat, Dr. Lester C. Hunt.

Possessing a membership more than four times as large as its sister chamber, the House of Representatives has rarely, if ever, had a roll call when there was not at least one dentist-legislator present. In the Senate, however, such is not the case. In that branch of Congress, while champions of legislation affecting dentistry have worked diligently and more often than not been successful, the torch bearer, at least in recent years, has not been a member of the profession concerned. On the other hand, a dentist practically single-handedly pushed the National Dental Research Act through Congress in the House last summer. He was Dr. Walter E. Brehm, Republican representative from Ohio's 14th District and who, incidentally, faced strong opposition for re-election.

At this writing it was impossible to say who would be the junior Senator from Wyoming when the 81st Congress convenes in January. But one might venture to predict that if Governor Hunt, of Lander, Wyo., were victorious, he would take more than passing interest in the sizable quantity of legislation bearing directly or indirectly upon the profession which is expected to be introduced in the Congress next year. A few of the subjects to be considered are: Army and Navy Dental Corps inducements and other changes; health insurance; appropriations required to effectuate the National Dental Research Act and federal subsidization of dental education.

Veterans Administration

Veterans Administration, the Nation's biggest purchaser of dental services, is not likely to introduce any major policy changes before early next year. Although it is beset by criticism from many sides, VA's plans, as of mid-October, seemed to be to avoid any important reforms while political campaigning was under way in order to keep clear of possible charges that the revisions had ulterior motivation. That apparently was the attitude of Administrator Carl R. Gray at the time of his departure on an extended inspection tour which was to take him into scores of veterans' hospitals and branch and regional offices.

Army Commissions

Army, confessing it was "scooped" by the Navy, is working on its own plan to commission a limited number of senior dental students. The Navy scheme was made public October 13. Its main provisions are: authorized appointment of 100 last-year dental students as probationary ensigns in the Naval Reserve, on active duty status; full pay of an ensign ($238.72 or $282.58 a month, depending

upon whether the appointee has dependents, plus $250 as allowance for uniforms); no compulsion to wear the uniform while a student.

To be eligible for appointment, candidates must agree to serve as Lieutenants (junior grade) for at least two years following graduation, exclusive of internship time. It is probable that the comparable Army plan, now being prepared for General Staff approval, also will require two years of post-graduation active duty.

Hoover Commission's Task

The workings of one of Washington's longest-titled official agencies, namely, the Commission on Organization of the Executive Branch of the Government, have puzzled a good many persons, for a variety of reasons. Not the least of these reasons is that: with a committee on medical and hospital services whose function is to take stock of the Government's health and hospitalization proclivities, then make suitable recommendations to Congress for maximum efficiency of operation, how could its job be considered a thorough one when neither its membership, professional staff nor consultants include a single dentist?

The committee, whose chairman is Tracy Voorhees, Assistant Secretary of the Army, has subcommittees on neuropsychiatry, tuberculosis, preventive medicine and other specialties, but none on dentistry. Surgeons, hospital administrators, internists and researchers are represented on the body—but no dentists. Seemingly the Hoover Commission, as the parent organization is called (Herbert Hoover is its chairman), will present its final report to Congress in January with a minimum amount of study having been given by qualified dental personnel to organization of these professional services in the Army, Navy, Public Health Service, Veterans Administration, Bureau of Indian Affairs and other branches of the Federal Government.

Another Army Headache

The first in a series of orientation conferences sponsored by the National Military Establishment and which is scheduled to open in Washington November 8 has been, in its planning stage, a headache to aides of Secretary of Defense James Forrestal. Since the persons invited to attend the session will be flown to observe Army, Navy and Air Force demonstrations in Florida and Georgia, it has been necessary to keep the guest list down to a "workable figure" of 70. A good many organizations whose officers did not receive invitations for the first conference—"at least one more will be held but I wish this first one were the last," one harried official told your correspondent—have not been hesitant to register ruffled feelings. Also, the Forrestal office is receiving protests from the press against the decision to bar reporters from sessions of the assembled professional, industrial, labor, clerical and educational leaders.

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Honorary Member

Irl C. Schoonover, director of the dental materials section of the National Bureau of Standards, in Washington, D.C., has been named an honorary member of the American Dental Association by the House of Delegates for his outstanding work in dental materials research.

Dr. Schoonover, employed at the Bureau since 1934, took his Ph.D. in chemistry from Princeton University in that year. He previously had taken an M.A. from Princeton and he holds an A.B. from George Washington University.

OUTLINE STATE CONFERENCE PROGRAM:

Important Management Problems Listed

Final plans are being completed for a five-day round table conference to be held in Chicago, November 15-19, for state dental society administrators, according to L. M. Cruttenden, assistant secretary of the Association.

"Objectives of the conference," Dr. Cruttenden states, "are to analyze some of the important problems pertaining to management of dental society affairs and to discuss methods for meeting them; to acquaint state society administrators with methods and technics found to be effective; to show the relationship between certain state and national functions; to direct attention to those functions which the state and national groups should attack cooperatively and to direct attention to those Central Office activities that have a counterpart at the state level."

A general program has been set up which calls for discussions to begin at 9 a.m. daily. One section dealing with administration of a dental society will include consideration of "the meaning and importance of bylaws, the establishment and administration of policy and the conduct and finance of society activities." Dr. Harold Hillenbrand, secretary of the Association will be the topic leader.

The second group of topics will deal with a "program of the dental society." Included in this section are the following:

Maintaining the membership, L. M. Cruttenden, topic leader; objectives and technics of a public relations program, H. B. Bain, topic leader; the handling of a professional relations program, A. O. Gruebbel, topic leader; publication problems of a dental society, L. W. Morrey, topic leader; the business aspects of an annual session, J. J. Hollister, topic leader and the professional side of the annual session, L. M. Cruttenden, topic leader.

Mid-winter Meeting

News of other forthcoming meetings is led by a Chicago Dental Society announcement that its 84th annual mid-winter meeting will be held Feb. 7-10 at the Stevens Hotel, Chicago.

A full program of essays, limited attendance clinics, table clinics and motion pictures will be presented, according to Society officers. Scientific and commercial exhibits also are planned.

Hotel accommodations may be secured by writing the hotels or the office of the Chicago Dental Society, 30 North Michigan Ave.

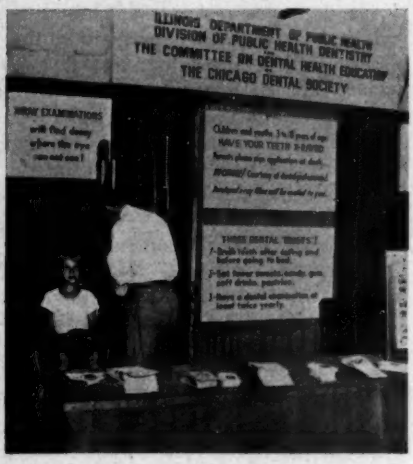
Orthodontists.—The American Board of Orthodontics announces that its 1949 meeting will be held at the Commodore Hotel, in New York, April 28-30 and May 1. The Board also stated recently that orthodontists desiring certification by the Board may obtain application blanks from Dr. Stephen C. Hopkins, 1726 Eye St., N.W., Washington, D.C.

Fraternity.—The Sigma Upsilon Delta fraternity will hold its annual dinner in conjunction with the Greater New York Meeting, December 8, at the Hotel Pennsylvania, in New York, according to Dr. Alexander L. Ungar, chairman of the dinner committee. This year the dinner is being held in honor of Dr. Maxwell A. Heckler, who recently retired from office after serving 25 years as grand treasurer. For reservations write Dr. Ungar, 211 Central Park West, New York, N. Y.

Aid Dental Health

Dental societies also were active last month in the public health field with the Chicago Dental Society leading the parade. Early in the month, a 15-minute radio program over the Chicago Board of Education's FM station was initiated and will run for 10 weeks. One unique

feature of the show is its audience; some 55,000 fourth and fifth grade students. They will hear the program in the classroom at 11:15 a.m. A handbook for instructors also has been prepared which will aid teachers to institute other dental health projects in connection with the radio show.


ILLINOIS DEPARTMENT OF PUBLIC HEALTH
DIVISION OF PUBLIC HEALTH DENTISTRY
THE COMMITTEE ON DENTAL HEALTH EDUCATION
THE CHICAGO DENTAL SOCIETY

A Practical Exhibit

Recently the Chicago Dental Society cooperating with the State Health Department operated a booth at the Cook County (Ill.) Fair where children visitors were given free bite-wing x-ray examinations. Among the 1,160 children x-rayed, there were nine from other states ranging from Oregon to New York. Most questions were asked about the use of sodium fluoride for the prevention of caries.

The demonstration was limited to children between the ages of 3 and 18 years and consisted of two bite-wing films for each child. The films then were given to the parents who in turn could take them to the family dentist. Many visitors had never witnessed the use of dental x-ray equipment before.

Dental Fellowship

Dr. J. Donald Shriber, of Los Angeles has been selected as the first essayist for the new Herbert Orin Sanford Fellowship. He will speak on "nutrition-biochemical-endocrine factors in diagnosis and treatment of oral diseases."

The fellowship was set up recently by Mrs. H. O. Sanford, widow of the late president and general manager of the Western Dental Supply Co., of Salt Lake City. It is administered by Mrs. Sanford, a representative of the Utah State Dental Society and the Utah State director of dental health. This year Dr. William Wood represents the State Society and Dr. R. C. Dalgleish, American Dental Association trustee from the 13th district, is the present state dental director.

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Dental Health Day Plans Are Advanced

Plans for a National Children's Dental Health Day, February 7, were advanced recently when the Association's Council on Dental Health sent a tentative program to state and constituent dental societies throughout the country.

Dr. Allen O. Greubbel, secretary of the Council, also states that plans for securing a proclamation by the president of the United States setting the first Monday in February as Children's Dental Health Day are underway.

The suggested program is based on one used in recent years by the Cleveland, Akron and Cincinnati Dental Societies and the Michigan State Dental Society, and is designed to bring the importance of children's dental health more forcefully into the public and professional view.

Included with the list of suggested activities are sample radio scripts, press releases, contest ideas, a list of available A.D.A. dental health publications and suggestions for a day of professional clinics and lectures.

ARMY REVISES DENTAL CORPS REGULATIONS:

Creates Position of "Dental Surgeon"

A revised set of regulations, apparently designed to provide a measure of administrative parity for the Army Dental Corps with the Medical Corps, have been approved by Gen. Omar Bradley, Army chief of staff. This action followed closely a recommendation passed in September by the House of Delegates of the American Dental Association urging the Council on Legislation to secure Congressional action in establishing administrative parity.

The new order specifies that a dental surgeon be appointed for all major commands, armies, divisions and other headquarters and that he be responsible to the commanding officer rather than to the senior medical officer. However, even though the dental surgeon will have staff status, he still must "consult with the surgeon of the command on all matters arising in the course of his duties and functions with respect to the dental health of the command." Enlisted dental personnel, who now have their own units, also will be under the dental surgeon's command.

In a paragraph devoted to "Administration," the regulations state that the chief of the dental division of the Army Medical Department remains an assistant to the surgeon general who is a physician.

Pertinent paragraphs in the new regulations include the following:

In a major command, army, division or other headquarters, including installations, matters relating to the dental service are administered by the dental surgeon of the command. He is responsible directly to the commanding general/officer for all professional, technical and administrative matters pertaining to the dental health of the command. He will consult with the surgeon of the command on all matters arising in the course of his duties and functions with respect to the dental health of the command.

The dental assistant to the Surgeon General will be known as chief, dental division, and will be assigned to the office of the Surgeon General.

The basic title for the senior dental officer of a command or installation is dental surgeon.

The chief, dental division, in the office of Surgeon General, will be responsible for making recommendations on all matters relating to the dental health of the Army and for the progressive development of the dental service.

The duties of the dental officer as such are three-fold in character, namely: (1) Professional—Duties incident to the practice of dentistry, including physical examination for the preservation and promotion of dental health. (2) Advisory—Duties pertaining to a dental officer as a staff officer. (3) Administrative—Duties pertaining to a commander of Medical Department (dental) personnel and establishments.

Duties of the "dental staff officer" created by the new regulations are stated as follows:

There will normally be a staff dental officer for each major command or installation. Normally, the senior dental officer present for duty with the command or installation will, in addition to his other duties, be staff dental officer. The basic title as a staff dental officer will be Dental Surgeon which, as commonly used in military service, indicates a staff or advisory position rather than a professional qualification and is analagous to such terms and positions as quartermaster, adjutant, etc. A dental surgeon of a command or installation or any other headquarters will be responsible for the preparation of plans and policies for the progressive development of the dental service, with special reference to measures for the preservation of the dental health of the command by the prevention, treatment and control of dento-oral diseases, injuries and deficiencies among persons subject to military control; and for advising measures to place approved plans and policies into effect. The

dental surgeon will advise the surgeon in all matters that may have a bearing on the health of the command from a dental standpoint.

This section of the regulations is followed by a list of specific duties which include such responsibilities as recommending promotions for both officer and enlisted personnel; keeping the medical supply officer informed about supplies; recommending new construction and installation of other facilities; recommending training plans and programs for dental personnel to the commanding officer and providing the surgeon with "information copy of any reports or communications reflecting the dental health of a command."

In a paragraph dealing with enlisted personnel it is stated that individuals assigned to the medical department and given an "SSN" peculiar to the dental service will "ordinarily be detailed to duties commensurate with their training and experience and will not be used on other duties except in emergency."

Dentist Needed

Other recent Army developments included announcement by the Mobile Air Materiel Area, Brookley Air Force Base, Mobile, Ala., that an assignment paying $5,232 a year is open for a qualified civilian dentist. The statement from Mr. William N. Ballard, chief of the Employe Utilization Branch, civilian personnel section, says that the position demands a 40-hour week, eight-hour day, Monday through Friday. There are no restrictions, he says, which would prevent the dentist from carrying on an outside practice.

Adm. Lyle, of Navy, Retires

Recent developments in the Navy Dental Corps were topped by the retirement in August of Adm. Alexander Gordon Lyle, former assistant chief of the bureau of dentistry and chief of the dental division.

Adm. Lyle was advanced on the retired list to vice admiral since he is holder of a Congressional Medal of Honor in addition to two Silver Star medals and other decorations. He was the first dental officer to achieve flag rank.

During his more than 33 years in the Navy, Adm. Lyle served aboard a number of warships and it was while serving with the 5th Regiment of Marines in France during World War I that he was awarded the Congressional and other combat medals. He is a graduate of Baltimore College of Dental Surgery, class of 1912. It is reported that the Admiral and Mrs. Lyle will settle in Newport, R. I.

New Dental Tech Rating

Adm. C. V. Rault, chief of the Navy Dental Corps, has announced a new dental technicians' rating for enlisted men in the Regular Navy assigned to duty with dental officers.

Men are now being recruited directly for training in one of the three Naval dental technicians schools and may achieve ratings as high as warrant officer and chief warrant officer, the announcement states. The duties of such technicians are listed as assisting dental officers in handling patients, giving oral prophylaxis under supervision, rendering first aid and carrying out various administrative assignments. In addition, they may qualify for such specialties as prosthetic dental technology, maintenance and repair of dental equipment, dental research assistant, dental clerical procedures, property and accounting, clinical laboratory technology, x-ray technic, pharmacy and chemistry, dental photography, dental chemistry, dental illustration, sound motion picture operator, dental stenographer and acrylic eye illustrator.

Navy Names Consultants

The following civilian dentists recently were appointed consultant-instructors in the Navy's dental intern training program: Drs. Malcolm W. Carr, director of oral surgery at Metropolitan Hos-

pital, New York, as consultant-instructor in oral surgery at St. Albans Naval Hospital; Clyde H. Schuyler, former professor of prosthetic dentistry at New York University college of dentistry, as consultant-instructor in full and partial denture prosthetics at St. Albans; Samuel S. Wald, assistant professor of roentgenology, diagnosis and oral cancer at New York University college of dentistry, as consultant-instructor in diagnosis and roentgenology at St. Albans; Lyall O. Bishop, lecturer in oral surgery at the College of Physicians and Surgeons, San Francisco, as consultant-instructor in oral surgery at Oakland Naval Hospital and Lester W. Burket, professor of oral medicine at the University of Pennsylvania school of dentistry and the graduate school of medicine, Philadelphia, as consultant-instructor in oral diagnosis at the Naval Hospital there.

Closer Relations A move toward closer relations between the U.S. Navy Dental Corps and dentists in the Argentine Navy was made when three U.S. naval dental officers were invited to visit Argentina following graduation exercises for men completing postgraduate courses at the naval dental school, National Naval Medical Center, Bethesda, Md.

The Navy department accepted the invitation offered by Senor Don Oscar Ivanissevich, Argentine ambassador and the following dental officers made the visit: Capt. Ralph W. Taylor, Cmdr. Frank E. Frates, Jr. and Cmdr. Leonard E. Johnson. Capt. Taylor, a diplomate of the American Board of Oral Surgery, lectured, operated and gave clinics in oral surgery.

Cmdr. Frates represented the field of operative dentistry and Cmdr. Johnson represented the field of prosthetic dentistry.

The group visited the Argentine Naval Medical Center, the submarine base at Mar del Plata, the naval station at Puerto Belgramo and the cities and provinces of Cordoba and Mendoza.

Dental Lectures.—Among many prominent dentists who have lectured recently to Navy dentists are: Dr. LeRoy M. Ennis, professor of dental roentgenology at the University of Pennsylvania and a trustee of the American Dental Association and Dr. Irl C. Schoonover, chief of the dental materials section of the National Bureau of Standards and recently elected honorary member of the A.D.A.

VETERANS' CONCERN OVER DRAFT MOUNTS:

V. A. Report Shows $50-Million Dental Bill

The possibility of a new draft of professional personnel and a financial report by Veterans Administration which stated that about $50,000,000 was paid to private dentists for treatment of veterans' teeth during the fiscal year ended June 30, highlighted the month's news.

In line with previous estimates made by V.A., figures in the report show about 90 per cent of the dental care provided for veterans last year was performed by private dentists. The V.A. also disclosed that it processed more than 1,250,000 claims during the year and that dentists in New York State alone received about $8,500,000 in fees from the federal agency. Cases disposed of during the year totalled 1,084,735, leaving a backlog of 291,330 on July 1. (The V.A. recently informed an officer of the American Dental Association that it had no plans to expand its dental clinics and that several, in fact, have been closed.) A breakdown of the V.A. report by states follows:

TREATMENT CASES COMPLETED

	VA STAFF DENTISTS		PRIVATE DENTISTS	
	Number	Value	Number	Cost
Total	53,198	$2,478,375	602,617	$44,691,814
Ala.	1,049	49,002	2,285	147,442
Ariz.	1,410	37,783	680	35,099
Ark.	596	20,941	3,964	256,860
Calif.	4,019	195,352	26,362	2,354,119
Colo.	1,829	77,057	2,980	184,883
Conn.	230	16,245	4,744	422,758
Del.	515	23,677	839	56,329
Fla.	2,972	144,025	5,166	393,755
Ga.	243	13,987	6,659	504,528
Ida.	359	15,638	3,251	217,722
Ill.	906	60,688	32,267	2,796,308
Ind.	289	23,389	19,811	1,433,445
Iowa	360	22,095	12,433	935,126
Kans.	203	10,977	5,932	321,964
Ky.	415	16,124	11,450	910,552
La.	1,506	89,857	3,152	211,239
Me.	133	6,678	1,872	113,261
Md.	2,238	99,381	2,527	199,079
Mass.	69	3,991	7,770	630,726
Mich.	1,830	90,435	14,643	1,006,767
Minn.	446	29,456	58,587	4,285,447
Miss.	550	16,060	1,585	102,212
Mo.	2,107	110,802	14,949	944,068
Mont.	85	1,323	4,978	352,111
Nebr.	442	21,998	7,838	544,398
Nev.	191	7,992	513	38,707
N. H.	44	1,223	1,977	118,638
N. J.	459	30,455	24,499	1,766,925
N. M.	785	27,486	560	44,779
N. Y.	4,380	176,814	92,751	7,688,011
N. C.	1,342	74,950	7,861	539,560
N. D.	45	1,242	4,302	254,483
Ohio	1,611	60,279	27,438	2,239,482
Okla.	428	21,566	7,365	471,695
Ore.	591	37,014	6,022	523,465
Pa.	5,805	277,507	77,040	4,990,937
R. I.	781	47,125	1,273	102,050
S. C.	228	9,360	1,878	125,701
S. D.	173	10,330	6,064	342,267
Tenn.	546	35,158	1,940	134,217
Tex.	5,481	210,801	8,041	478,452
Utah	1,038	30,667	2,501	129,176
Vt.	96	7,961	472	30,458
Va.	464	19,784	7,894	496,620
Wash.	597	24,093	7,457	761,570
W. Va.	1,021	42,621	3,076	218,281
Wis.	646	37,214	41,338	2,780,600
Wyo.	97	6,369	1,336	99,956
Alaska	0	0	446	65,240
D. C.	1,304	74,637	6,923	601,409
Hawaii	239	8,726	3,471	184,770
P. R.	5	40	1,455	104,167

EXAMINATION CASES COMPLETED

	VA STAFF DENTISTS		PRIVATE DENTISTS	
	Number	Value	Number	Cost
Total	280,560	$3,055,282	420,440	$5,539,360
Ala.	2,121	18,132	2,439	16,874
Ariz.	1,536	10,307	343	2,758
Ark.	2,180	31,201	2,295	35,136
Calif.	23,811	272,222	11,159	158,827
Colo.	2,448	16,206	2,328	15,770
Conn.	6,062	77,359	414	5,801
Dela.	850	6,998	263	2,056
Fla.	6,698	90,096	2,743	33,767
Ga.	3,738	56,722	3,161	36,415
Idaho	755	9,472	2,570	32,507
Ill.	12,844	156,052	43,737	607,096
Ind.	1,498	20,162	7,032	96,610
Iowa	4,383	52,622	11,022	135,843
Kans.	642	7,126	3,816	58,257
Ky.	5,735	74,435	11,661	155,405
La.	3,455	65,422	2,557	48,637
Me.	487	3,888	1,397	19,538
Md.	4,174	58,256	1,464	20,494
Mass.	9,894	138,516	7,954	111,356
Mich.	11,366	49,744	9,607	111,213
Minn.	2,784	38,876	60,583	800,750
Miss.	1,007	9,106	1,649	15,120
Mo.	7,363	107,870	10,568	151,295
Mont.	755	8,460	5,345	72,661
Nebr.	1,002	12,351	5,270	73,911
Nev.	473	4,166	203	1,783
N. H.	766	10,674	2,038	28,218
N. J.	21,021	229,614	4,201	71,543
N. M.	1,072	9,385	516	4,221
N. Y.	35,561	235,032	70,058	899,373
N. C.	2,139	21,598	7,619	92,937
N. D.	473	6,195	5,593	74,578
Ohio	21,851	222,916	16,013	228,348
Okla.	1,052	14,033	7,709	119,535
Ore.	4,397	52,149	1,744	22,826
Pa.	32,014	330,964	33,251	370,425
R. I.	2,150	24,555	570	7,337
S. C.	2,998	32,028	1,535	16,132
S. D.	689	8,566	3,349	44,512
Tenn.	692	9,640	2,134	29,603
Tex.	8,579	108,789	7,101	100,569
Utah	1,988	13,270	1,785	18,805
Vt.	482	6,041	66	796
Va.	736	9,648	7,254	101,314
Wash.	4,771	64,689	5,849	87,418
W. V.	1,481	18,408	4,003	55,060
Wis.	8,002	104,375	17,367	242,334
Wyo.	231	2,533	1,085	12,983
Alaska	0	0	444	8,095
D. C.	5,155	69,782	3,916	54,780
Hawaii	3,262	48,659	1,390	20,303
P. R.	937	5,972	1,270	7,435

New Dentist Draft Likely

What, if any, new draft legislation aimed at securing dentists, physicians and other professional personnel for the expanding armed forces will be introduced into the 81st Congress still remains unknown.

No official pronouncements on the matter have been made but observers close to Selective Service and the armed forces continue to predict that there will be another attempt to draft professional personnel early in 1949. The Selective Service act passed by the 80th Congress originally called for drafting of dentists, physicians and related professionals up to 45 years of age. That section of the bill, approved by both the House and Senate sub-committees on military affairs, however, was killed before the bill finally went through.

Likely targets in a new draft will be A.S.T.P.'s and V-12's who were discharged without being sent to active duty.

Meanwhile, the Army and Navy both outlined their need for dentists and the Army considers its case critical.

Dr. Gerald D. Timmons, dean of Temple University dental school and advisor to Selective Service, reported in THE JOURNAL last month that the Army will be short of its June 1949 quota by 2,100 dentists while the Navy will have only 839 of a required 1,212 dentists on active duty.

What Veterans Are Thinking

Some indication of what dental and medical veterans think about the possibility of being drafted or recalled to active duty as reserve officers came in a report by the Dr. George K. Rhodes Post 776, of the American Legion in San Francisco. The post, made up of dentists and physicians, has more than 130 members, about a third of whom are dentists.

While most of the members are in sympathy with movements opposed to a draft of professional men over the 26-year-old age limit, the report states that they also believe a system of voluntary recruitment is unworkable. A subsequent poll shows that more than two-thirds of the membership favors a draft as the only practical method of filling the legitimate manpower needs of the armed forces.

Hospitals.—Another recent development in veterans' news is the allocation of 3,035 beds in Army hospitals for treatment of disabled veterans.

Dental Veterans

The National Dental Veterans League held its first annual meeting in conjunction with the Association's 89th annual session in Chicago recently and the following officers were elected: Drs. William B. Cockroft, Memphis, Tenn., president; Arthur W. Spivey, Indianapolis, president-elect and James M. Glenn, Collierville, Tenn., secretary-treasurer. The next meeting will be held during the Association's annual session at San Francisco in October, 1949.

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Dangerous Drugs

Dentists and physicians are being warned by the Food and Drug Administration that certain codes of procaine hydrochloride solution manufactured by C. B. Kendall Co., of Indianapolis and distributed in the area from Florida to Wisconsin and from West Virginia to Texas are causing severe necrotic damage upon injection.

Code 24830 was placed in circulation last February and has been found to have a high acid content with a pH of about 1 while code 64712 which has caused several reported necrotic reactions was found to have a pH of 2.9.

A recall program on code 24830 has not been entirely effective and pharmacological work being performed by the Administration indicates that both these products are "dangerous and should not be used."

DENTAL SCHOOLS PLAN BUILDING PROGRAM:

Need For Larger, Modern Units Cited

Plans are underway for a multi-million dollar dental school construction program among at least ten of the nation's 39 approved professional schools.

A survey of these ten schools conducted by THE JOURNAL indicates that most of them intend to proceed with construction as soon as possible since nearly every dental school in the country has reported record numbers of students applying for admission. The American Dental Association's Council on Dental Education has pointed out that nearly 75 per cent of the approved schools now are adequately housed.

Among the schools reporting estimated costs of new dental buildings, the University of Texas school of dentistry is high with a proposed expenditure of about $3,500,000.

About $5,750,000 will be spent on construction of a proposed medical-dental building for Loyola University (Chicago) while the University of Washington school of dentistry reports plans to incorporate its facilities in a similar structure.

Loyola also reports it will be able to handle 350 dental students and 12,000 patients annually.

Other schools reporting estimated costs are: Howard University college of dentistry, $2,000,000: University of Kansas City school of dentistry, $1,500,000 and the University of Tennessee college of dentistry, $2,000,000.

All of the schools place emphasis on adequate space for clinical and research laboratories and the larger institutions have outlined plans for dental students to study certain phases of the basic sciences in buildings designed to accommodate both medical and dental personnel.

A brief résumé of plans for each school follows:

Baylor University.—The new four-story building now under construction will have a student capacity of 240 to 250. It will contain a total of 140 chairs with one 75-chair general clinic, a 15-chair oral surgery clinic, a 12-chair children's clinic, a 12-chair periodontal clinic, a 16-chair prosthetic clinic and extra chairs in demonstration rooms. George L. Powers is dean.

Howard University.—Architect's plans are now in progress. The structure is being designed to accommodate about 80 dental students per class. There will be about 75 chairs and clinical provisions for classes in dental hygiene and dental assisting. The building should be ready for occupancy in two or three years. Russell A. Dixon is dean.

University of Kansas City.—Plans and specifications are now completed for a building which will provide for 400 students in dentistry, a school of dental hygiene and space for a graduate school. Facilities for research also will be provided and a complete operating unit for each junior and senior dental student is planned. Actual construction will await leveling of building costs. R. J. Rinehart is dean.

Loyola University (Chicago).—Architects' plans are complete and funds are being raised for a six-story medical-dental building. Two floors in the east wing will house the dental dispensary which will cost about $750,000. The fifth and sixth floors will contain joint medical-dental lecture rooms. Each of the pre-clinical science departments will be equipped with research laboratories as will departments in clinical instruction. R. W. McNulty is dean.

University of Oregon.—Plans are in progress for a five-story building which will have about 100,000 square feet of floor space. It will be part of a proposed medical center. Harold Noyes is dean.

University of Tennessee.—A new building now under construction will have five floors, is 100x300 feet in size and will have complete clinical laboratories. Basic sciences are housed

in other buildings on the medical campus. The dental school is planning an additional wing for graduate dental education. R. D. Dean is dean.

University of Texas.—Plans are being prepared for a dental branch building on the university's medical campus. They call for a new dental school, dental nursing school and a graduate school as well as a research institute and an institute of orthodontics. Construction should begin within a year. Completion is scheduled in two years. The dental building will accommodate about 400 dental students and about 100 women in dental nursing. Frederick C. Elliot is dean.

Tufts College.—Plans are in progress for converting an eight-story office building into a university "professional center." Work will begin in January and should be completed in time for the Fall semester. Joseph F. Volker is dean.

Medical College of Virginia.—Construction of a new dental school has been delayed until building conditions improve but when the new structure is erected it will allow for expansion of freshman dental classes to 60 or 65 students. An increase in clinical and laboratory activities also is planned. Harry Bear is dean.

University of Washington.—A new building to house all the health sciences is now under construction and the school of dentistry will be located in a wing which has four floors. Completion is scheduled for December. The new school will accommodate about 75 students per class and extensive clinic and laboratory facilities will be available. Ernest M. Jones is dean.

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Students and the Draft

In an effort to settle the problem of deferment of dental and predental students from the present military draft, a questionnaire has been sent to the deans of all dental schools. It is designed to provide information on individual students subject to selective service and to establish a figure on how many such students now are in school.

The questionnaire was prepared by Gerald D. Timmons, dean of Temple University's school of dentistry and advisor to Selective Service, in cooperation with the Council on Dental Education.

A tally of the information gathered in each school will be made by each dean for his own use and forwarded to Selective Service for use in formulating final plans for deferment of students.

According to Dean Timmons, Selective Service tentatively has accepted a plan whereby dental students may be recommended for deferment by the dean but the local selective service board still retains final authority on deferment. The plan also calls for each school to be supplied with a number of certificates of deferment equal to his normal needs.

The plan for deferment of predental students, however, is based on a sliding scale which takes into account that deferred veterans of World War II will diminish in number over the next three years. Under this system, predental students who have completed one year of college are eligible for certification for deferment by the dental school dean.

The dean, therefore, will receive certificates for 55 per cent of the 1949 freshman class, 62.5 per cent of the 1950 freshman class and 100 per cent of the 1951 freshman class.

The Council on Dental Education also announced recently that copies of its annual report on graduate, postgraduate and refresher courses offered by accredited dental school in the United States and by the Departments of the Army and Navy for 1948-49 are available on request to the Council's secretary, Dr. Shailer Peterson, 222 East Superior St., Chicago 11.

Other news of dental education includes announcement by the American Association of Dental Schools of officers elected to serve in 1948-49. They are: Drs. Roy J. Rinehart, University of Kansas City school of dentistry, president; Gerald D. Timmons, Temple University school of dentistry, president-elect; Charles W. Freeman, Northwestern University dental school, vice-president

and John E. Buhler, Emory University school of dentistry, secretary-treasurer.

Members elected to the executive committee in addition to officers already mentioned are: Drs. Carl O. Flagstad, University of Minnesota school of dentistry, Ernest G. Sloman, College of Physicians and Surgeons and Wendell D. Postle, Ohio State University college of dentistry.

Those appointed to serve on the A.D.A.'s Council on Dental Education are: Drs. Robert W. McNulty, Loyola University (Chicago) college of dental surgery; Bert L. Hooper, University of Nebraska college of dentistry and J. Ben Robinson, Baltimore College of Dental Surgery.

Dr. Speidel Resigns as Loyola Dean

Dr. Thomas D. Speidel has resigned as dean of Loyola University (New Orleans) school of dentistry and Rev. William D. O'Leary, M.D., S.J., regent of the school, became acting dean at the end of the summer session.

Under Dr. Speidel's leadership, Loyola's school of dentistry was granted "full approval" by the Council on Dental Education, American Dental Association, in August of last year.

T. D. Speidel

In his new assignment as chairman of the division of orthodontics at the University of Minnesota school of dentistry, Dr. Speidel will continue work in orthodontic teaching and research in which he has been engaged since his graduation from the University of Iowa in 1930. He has been a member of the A.D.A. Committee on Library and Indexing since 1941; editor of the Journal of Dental Education from 1940 to 1947; president of the Supreme Chapter, Omicron Kappa Upsilon in 1944 and 1945 and is retiring president of the American Association of Dental Editors for 1948.

Fr. O'Leary who is a physician as well as clergyman has been regent of the dental school for the last year and now becomes acting dean. He was graduated from the University of Georgia school of medicine in 1921 and was president of Spring Hill College, Mobile, Ala. from 1938 to 1946.

News briefs from dental schools around the country follow:

University of Illinois.—Bernard G. Sarnat has been appointed a professor and head of the department of oral and maxillofacial surgery, according to Dean Allan G. Brodie. Dr. Sarnat has been acting head of the department since November 1946.

Dr. Brodie also announced the appointment of Dr. Edward H. Ragan as assistant professor in the department of crown and fixed partial dentures.

The college of dentistry will offer two postgraduate courses on February 11-12. They will be in "Recent Advances in Caries Control" and "Periodontia III: Histopathology of the Gingival and Periodontal Structures." These will immediately follow the mid-winter meeting of the Chicago Dental Society. Registration may be made by writing Dr. Isaac Schour, University of Illinois college of dentistry, 808 South Wood St., Chicago 12.

Temple.—A second annual course on the Edgewise Arch Mechanism will be held by Temple University school of dentistry, Philadelphia, from January 23 to February 5, Dean G. D. Timmons announces.

The course, open only to orthodontists, will be directed by Dr. Robert W. Strang and associates. Applications may be requested from the school of dentistry, 3223 N. Broad St., Philadelphia.

University of Pittsburgh.—Appointment of Gerald J. Cox as director of dental research in the school of dentistry has been announced by Dr. R. H. Fitzgerald, chancellor of the University. Dr. Cox has been a reseach chemist for the Corn Products Refining Co. since 1944 and formerly was a senior fellow at Mellon Institute.

G. J. Cox

It also has been disclosed that Dr. J. S. Oartel has resigned as associate professor of pathology and lecturer in technical composition to accept a lieutenant colonel's commission in the Army Dental Corps. He is a past-president of the Dental Alumni Association and the Odontological Society of Western Pennsylvania and is vice-chairman of the Pittsburgh section of the American College of Dentists. He currently is president-elect of the Pennsylvania State Dental Society.

University of Pennsylvania.—A booklet containing the tentative program of postgraduate dental courses for 1948-49 now is available, according to Dr. Lester W. Burket, director of the dental school's postgraduate division.

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A.D.A. Special Committees Organized

Two special committees have been organized according to recommendations approved by the House of Delegates. The first is to survey the affairs of the Association and report back to the House at the 1949 annual session to be held in October at San Francisco. Dr. Frederick J. Wolfe, Sr., of New Orleans is chairman. Other members are: Drs. Otto W. Brandhorst, of St. Louis and Edward R. White, of Jersey City, N. J.

Dr. Harry Lyons, of Richmond, Va., has been named chairman of the other special committee which will deal with national emergency dental service. Also on the committee are: Drs. LeRoy M. Ennis, trustee from Philadelphia; Percy T. Phillips, of New York; Gerald D. Timmons, dean of Temple University dental school, Philadelphia and C. J. Wright, of Lansing, Mich.

Dr. Dean Named Director of N.I.D.R.

The establishment of the National Institute of Dental Research and the appointment of H. Trendley Dean as its director were announced recently by Oscar R. Ewing, Federal Security Administrator.

Dr. Dean, in the U. S. Public Health Service since 1921, has been director of the dental research section of the National Institutes of Health, research branch of U.S.P.H.S.

The new institute was created by the 80th Congress but funds for its proposed building have not yet been authorized and work will continue in present quarters until the new unit is constructed.

Dr. Dean brings to his new assignment a background which includes a D.D.S. from St. Louis University in 1916 and directorship of dental research at the National Institutes of Health since 1931. He served as a captain in the Army Dental Corps in World War I and is past-president of the Association of Military Surgeons, a fellow of the American College of Dentists and past-president of the International Association of Dental Research.

H. T. Dean

GENERAL NEWS

N.S.R.B. Appoints

Staffing of the National Security Resources Board medical division was completed recently with the appointment of chiefs of four key sections.

The new appointees have been assigned to work under Dr. James A. Crabtree, division director, by Arthur M. Hill, chairman of the Board. They are: Rear Adm. Thomas Carlyle Anderson, MC, USN, in charge of medical and related manpower; Lt. Col. Howard B. Nelson, in charge of planning for health supplies; Vincent B. Lamoureux, in charge of sanitary engineering aspects of national security and Ruth Freeman, in charge of the section on public health nursing. Miss Freeman is on loan from her position as administrator of American National Red Cross Nursing Service.

Hospital Plan.—A second quarter growth of 964,926 new members in non-profit Blue Cross hospital service plans has been announced by the Blue Cross Commission of the American Hospital Association. This brings total enrollment to more than 31,000,000 in the 89 plans, 84 of which operate in the United States, the remainder in Canada.

Dr. K. H. Metz Resigns From Council Post

As a result of being recalled to military service, Dr. Karl H. Metz, of Valhalla, N. Y., has resigned as chairman of the Association's Council on Federal Government Dental Corps. This action is mandatory under the new Constitution and Bylaws which state that members of the Council may not be in the employ of the federal government.

Dr. Metz is returning to duty in the Army with the rank of lieutenant colonel and will be stationed at Fort Devons, Mass. He previously had served on Gen. Eisenhower's staff as executive officer in charge of industrial production in Germany. He also saw service in Africa.

A successor to Dr. Metz on the Council will be appointed by President Clyde E. Minges, according to the Bylaws, and will serve until another representative is elected by the House of Delegates.

Dr. Robinson, Past-President of A.D.A., Dies

Dr. Wilfred H. Robinson, president of the American Dental Association in 1941 and member of the Board of Trustees from 1933 to 1939, died at his home in Oakland, Calif. on September 14.

W. H. Robinson

Dr. Robinson was born in 1882 and was graduated from the College of Physicians and Surgeons at San Francisco in 1908. He then left the west coast to practice dentistry at Reno, Nev. returning in 1909 to Oakland. In 1930 he became a member of the California State Board of Dental Examiners in which post he served until 1939. He was president of the National Association of Dental Examiners in 1935 and president of the California State Dental Association in 1930.

Dr. Semans, of Ohio State, is Dead

Dr. Harry Merrick Semans, former dean of Ohio State University's college of dentistry and noted dental educator, died July 29 at Colorado Springs, Colo.

Dr. Semans received his B.S. from Ohio Wesleyan in 1890 and worked for an advanced degree at that school and at Ohio State meanwhile traveling during

the summer with a Chautauqua unit. He matriculated in the Philadelphia Dental College in 1894 and received his D.D.S. from New York College of Dentistry in 1897 after which he began practice at Columbus, O. and became a staff member of Ohio Medical University. He was appointed a professor of operative dentistry in 1903 and dean of the dental department of Starling-Ohio Medical College in 1907.

In 1914, when Starling-Ohio became a part of Ohio State University, the dental department, through Dr. Semans' efforts, became the University's college of dentistry. He also is credited with helping to institute the present predental and dental curriculum used in most accredited schools.

Dr. Semans served as president of the Columbus Dental Society, the Ohio State Dental Society, the American Institute of Dental Teachers and the American Association of Dental Schools.

A Decision on Ethics

Dentists' notices to patients regarding technics and methods probably are prohibited under the code of ethics established by the American Dental Association.

The opinion on this matter was delivered to Dr. Albert E. Rosenthal, of Miami, Fla. by Dr. Ernest G. Sloman, chairman of the A.D.A.'s Judicial Council, following a query about the advisability of notifying patients of the availability of sodium fluoride treatment for children's teeth.

Dr. Rosenthal outlined in a letter regarding the subject that a "constant stream of inquiries" have been coming into his office asking about the treatment.

Dr. Sloman stated in his opinion that section 3 (cards, letterheads and announcements) of the A.D.A.'s code of ethics "prohibits or at least warns against notices to one's patients regarding technics and methods of practice."

An extract from the section as quoted in Dr. Sloman's letter to Dr. Rosenthal states: "There should be little or no occasion for sending announcements to one's patients. Judicious exceptions may be made in instances in which one changes his place of practice, or discontinues general practice to engage in a specialty, or returns to practice after protracted absence."

Dr. Sloman further pointed out that in addition to A.D.A.'s ethical stand, there may be more specific restrictions in the state society's code.

Four American dentists, three from the United States and one from Canada, were awarded fellowships in dental surgery by the British Royal College of Surgeons during July. They are shown in the photos above. Top: (left to right) Drs. Andrew F. Jackson, Philadelphia and Daniel F. Lynch, Washington, D. C. Bottom: (left to right) Drs. Malcolm W. Carr, New York and Roy G. Ellis, Toronto. They are the first Americans afforded this honor.

CASES AND COMMENTS

Appliance for Arch Expansion. By John Heath, L.D.S., Melbourne, Australia.

Many methods have been used for enlarging the dental arch in order to make room for crowded teeth. Some of these methods have proved uncertain in their results, some are complicated and some involve the expenditure of much time and energy.

Probably the best known appliance is the orthodontic arch wire, threaded and with a nut at each end, which was introduced by Angle. Recently, the use of stainless steel has made the thread and nut method less acceptable.

Stainless steel wires combine high tensile strength with lack of brittleness, making it possible to use wires of smaller diameter to exert the force necessary for tooth movement. These slender wires will recover from a bend to a greater extent than the wires formerly used, because of their size and tensile strength. The farther an arch wire will spring and recover, the greater is its capacity for tooth movement per unit of time spent on applying and adjusting it.

I use chiefly three types of high tensile arch wires: (1) a multiple-wire arch composed of fifteen .006 inch wires, (2) a round wire of .015 inches and (3) a square wire of .022 inches. Any of these types may be employed in the method of arch expansion to be described, but .022 inch square wire will be used for illustration. The principle can be applied to increasing the size of the whole arch or the distance from tooth to tooth.

The end of the .022 inch square wire is softened by heating, and about half an inch is bent back on itself. The double end now measures .044 by .022 inches.

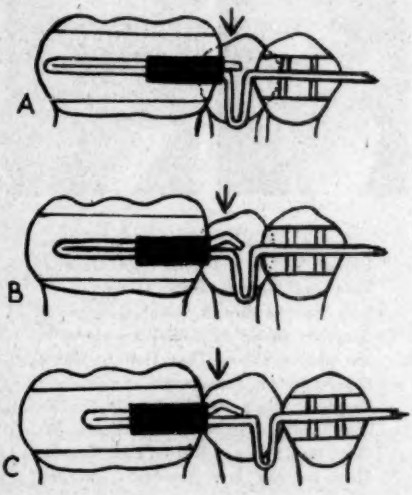
A special tube (black portion in the illustration) with a hole .044 by .022 inches is slipped over the doubled arch wire, which may require some trimming to make it fit. Much time can be saved by keeping stocks of arch wire prepared in this manner.

The appliance is attached to the teeth as shown in A. It will be noted that the rectangular tube is soldered to the molar band in a position mesial to the usual one. This allows a greater length of the doubled wire to extend beyond the tube without inpinging on the soft tissues. However, if space is limited, the doubled end may be softened and bent temporarily toward the tooth. The tube may have to be soldered near the gingival margin of the molar band, particularly on lower molars, to avoid the buccal cusps of the opposing teeth.

The mechanical principle involved is illustrated in the figure. To adjust the apparatus, the free end of the softened arch wire is picked up in pliers, drawn forward the requisite amount and then bent sharply upward. This prevents the arch from returning to its former position. The end is then turned down as in B. A further extension is seen in C, with the end of the wire cut off for neatness.

The simplicity, safety and efficiency of this mechanism makes it certain of wide acceptance both for arch expansion and as a space maintainer.

The same .044 by .022 inch tube will be found effective for the .015 inch wire bent nearly on itself but not softened, and for a multiple-wire arch of fifteen .006 inch wires soldered together at the ends with silver solder, and flattened with pliers to fit the tube. —*5 Collins Street.*



Movement of teeth to provide room for a second bicuspid

Bridgework and Periodontal Treatment: Report of a Case. By Sidney Sorrin, D.D.S., New York.

In the treatment of periodontal disease, a decision often must be made as to whether a certain tooth after treatment may be utilized for an abutment. The tooth or teeth involved may be mobile, and splinting to firmer teeth may be necessary. After much work the restoration is completed with satisfactory results. Sometimes a periodontal abscess may develop or the tooth may become devitalized and require extraction, thus ruining the bridge.

In the following case these difficulties were encountered, and a procedure is suggested which may be of value. This method is not new as a number of dentists have employed it for many years.

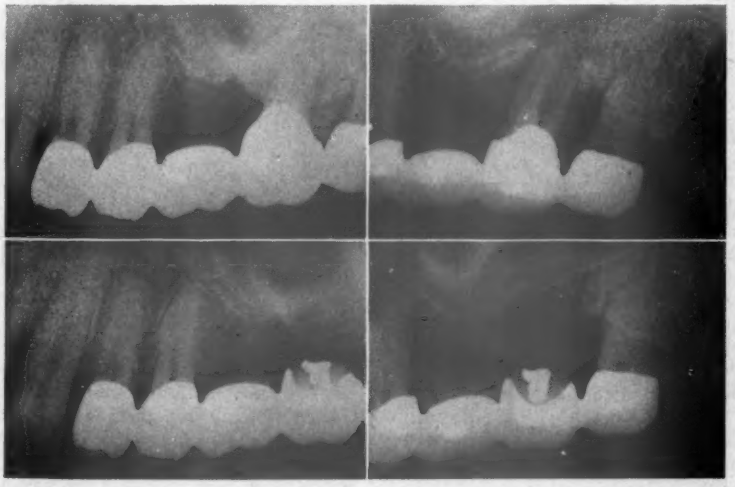
Report of Case

A man, aged 49 years, was treated for periodontal disease. A gingivectomy was performed on the molars in an attempt to retain these teeth and thus avoid the necessity of constructing a partial denture. A fixed bridge was constructed, replacing the first molar. It consisted of three-quarter crowns on the first and second bicuspids, a three-quarter crown on the second molar and a complete cast crown on the third molar. These were all soldered together.

Three years later, a periodontal abscess developed on the second molar, involving the bifurcation (illustration, above). The prognosis was unfavorable, and extraction was advised. It would have been difficult to remove the bridge without injuring the remaining teeth. The following procedure was employed: 1. The left second molar was injected, and the roots were severed from the crown and then removed. 2. The pulp was removed, the pulp chamber was filled, and the remainder of the crown was smoothed.

The coronal portion of the tooth is still intact, and the bridge is functioning well (illustration, below). There was no necessity for the removal of the bridge.—*745 Fifth Avenue.*

Associate professor of periodontia, College of Dentistry, New York University.



Above: The bridge in position. Note the bifurcation involvement of the second molar. Below: The same bridge a year after resection of the roots of the second molar. (The bridge was constructed and the roots of the second molar were severed by Leonard R. Becker, New York)

Histamine Azoprotein in Treatment of Tic Douloureux.

By Walter R. Rousar, D.D.S., Chicago.

A woman, aged 43 years, appeared on September 13, 1947, with a complaint of excruciating pain induced in the left side of the face by the slightest touch and lasting for two or three minutes. The symptoms were of two months' duration. There were two trigger zones, one at the infra-orbital foramen and one at the supra-orbital foramen. Touching either of these caused intense pain. Subsequent questioning of the patient and the results of roentgenographic and clinical examination formed the basis for a diagnosis of trigeminal neuralgia involving the first and second divisions of the fifth cranial nerve.

Examination

Consultation to confirm the diagnosis was held with Helmut Blumenthal, a staff member of the Chicago Eye, Ear, Nose and Throat Hospital. The reaction to a Wassermann test was negative. Roentgenograms showed the frontal, ethmoid, maxillary and sphenoid sinuses to be well developed and clear. Results of a neurologic examination were negative and the family history showed no instances of psychotic diseases. Ear, nose and throat examination revealed no contributory conditions.

Treatment

At the suggestion of Dr. Blumenthal, who believed the affection to be a histamine headache, histamine azoprotein[1] was administered by subcutaneous injection into the arm. The patient received an injection twice a week, the dosage being increased by approximately .06 cc. each time, from an initial dosage of .06 cc. (1 minim). By the eighth week the injection was 1 cc. of the solution. Subsequent injections of 1 cc. were given once a week for an additional six weeks. The patient then had received a total of 14 cc. of histamine azoprotein. The table indicates patient progress.

It is interesting to note that the area which remained symptomatic longest was that which is innervated by those parts of the first and second division of the fifth cranial nerve that are embedded in soft tissue; namely, the nasal branch of the anterior ethmoidal nerve with its terminal branches and the sphenopalatine ganglion with its posterior nasal nerve. The remaining nerves of these divisions are embedded in bony tissue.[2]

History of Progress

Week of treatment	Dosage (cc.)	Effect
1	0.06	No change
	0.13	No change
2	0.19	Intensity of pain considerably lessened
	0.26	Pain almost gone except for very tender area on left side of nose
3	0.32	Patient can wash face and eat with no discomfort
	0.39	Tender area on left side of nose
4	0.45	No change
	0.52	Relapse into original severe pain over entire area for one day
5	0.59	Sensitive area on nose diminishing; no return of original pain
	0.66	No change
6	0.73	No change
	0.80	No change
7	0.86	Tenderness on side of nose almost gone
	0.93	No tenderness or pain
8	1.00	No symptoms
9	1.00	No symptoms
10	1.00	No symptoms
11	1.00	No symptoms
12	1.00	No symptoms
13	1.00	No symptoms (extracted lower left second molar, using 2 injections of 2% procaine, 2 cc. each)
14	1.00	No symptoms

15 minims = 1 cubic centimeter.

This report does not suffice to establish any conclusion or even any inference concerning the efficacy of the treatment outlined. It merely suggests that allergy may be a factor in this neurologic manifestation. The time element in this case also is inconclusive. It remains to be seen how long this patient continues to be asymptomatic.—*Chicago Eye, Ear, Nose and Throat Hospital Building, 231 West Washington Street.*

1. *Hapamine*, Parke, Davis & Company, Detroit.

2. Fischer, Guido, and Riethmuller, R. H., *Local Anesthesia in Dentistry*. Philadelphia: Lea & Febiger, Third American edition, 1923, p. 153.

Basic Principles of Programs for Dental Health Education in Elementary and Secondary Schools.

By Albert J. Soucek, D.D.S., M.P.H., Dental Director, Dearborn Public School System, Dearborn, Mich.

The effectiveness of the educational approach to the solution of health problems has long been recognized by leading authorities in the field of public health. Dentists are aware of the fact that the urge for dental care and the willingness to pay for such care are greatest in those segments of the population which possess most extensive dental health knowledge. At the same time, educators have realized that the development of the child's scholastic ability is but one of the responsibilities of elementary and secondary schools. These broadened concepts of education have manifested themselves by a new interest in the methods of presenting dental health information to the school child.

Frequently school administrators will request practicing dentists to help plan programs for dental health instruction in their schools. It is desirable, therefore, that the private practitioner be familiar with some of the basic concepts involved. An examination of dental health curriculums being offered in various schools throughout the country reveals a great diversity of objectives, scope and educational technics. Although it is true that no single approach excels all others, the objectives and basic principles of dental health instruction in schools should be reasonably uniform.

Objectives

Broadly speaking, the objectives may be stated as follows: (1) to teach the scientific facts which relate to the care and preservation of the teeth and associated structures, (2) to bring about in school children an increased awareness of the value of optimal dental health and (3) to motivate the school child to take the steps necessary for securing and maintaining dental health of an acceptable level. In order to attain these objectives, certain basic principles should be observed.

Basic Principles

The foremost essential of all dental health teaching is that the material presented be authentic and scientifically sound. Dentists and other health workers realize that many long accepted concepts of dental theory and practice have been disproved. Research, both in the laboratory and in the field, furnishes data which cause us to abandon old theories and to substitute new and proved ones. It is apparent, therefore, that dental subject matter being taught in elementary and secondary schools must be examined continually for validity.

Another basic principle to be observed in planning dental health teaching units is that the material selected be suitable to the age and grade level of the pupils. The trained educator is aware of the fact that this applies to content as well as method of presentation. Along with the consideration of this matter arises the necessity for making work progressive from grade to grade. The school child cannot be blamed for a disinterest in dental health teaching if the same facts are presented to him in the same manner from kindergarten to the twelfth grade.

It should be remembered that dental health in itself is not a subject of great fascination to the average school child. Therefore, dental health teaching must be made as interesting as possible by adapting various units of work to life situations and by minimizing the presentation of abstract facts and data as such. A final basic principle of dental curriculums in schools is that dental health instruction be correlated with other class work when this is practicable. Although certain aspects of dental health teaching can be incorporated with other school subjects, some aspects do not lend themselves readily to such incorporation. In the latter case the direct teaching approach must be utilized.

Comment

No attempt has been made to discuss in detail the matter of dental health education in elementary and secondary schools. However, studies of the methods and approaches that currently are being used in many schools indicate a need for better understanding of some of these fundamental concepts. Only when such concepts are understood by dentists and educators alike, will dental health education achieve its proper place in the school program.

Extraoral Removal of Unerupted Tooth.

By George Denicourt, D.M.D., and Salvatore Oddo, D.M.D., Providence, R. I.

Frequently, unerupted teeth are overlooked because of some more obvious condition which falsely appears to be the cause of the symptoms for which a patient seeks relief. The following report deals with such a case.

History

A well developed, well nourished woman, aged 39 years, presented herself for relief of pain and swelling of the left mandibular region. The patient stated that for the last ten or twelve years she had experienced vague pain at various times in the left inferior maxillary region. For the last two weeks the pain had been more severe than usual and a moderate induration became evident in this region.

A few days previously her dentist had made intraoral roentgenograms of the lower left second molar and had extracted it, apparently believing that this tooth was the cause of the symptoms. The unerupted tooth had not been seen in intraoral films.

Examination

A lateral roentgenogram of the left mandible revealed a completely inverted tooth whose cusps were at the lower border of the body of the mandible. Directly over the apex of the root was evidence of a recent extraction (see illustration).

The physical examination revealed no abnormal conditions except as noted in the oral region. Blood count was within normal limits, blood pressure was 110/70 and temperature was 99 F.

Preoperative Treatment

Thirty thousand units of penicillin was given intramuscularly every three hours. Hydrogen peroxide mouthwashes and other routine care were prescribed.

Inverted tooth directly beneath alveolus of recently extracted second molar

Operation

On the second hospital day the patient was taken to the operating room for extraoral removal of the inverted tooth. Preoperative medication consisted of morphine 0.01 Gm. (1/6 grain) and atropine 0.4 mg. (1/150 grain). Nitrous oxide-oxygen and ether were administered by means of a nasal endotracheal tube.

After sterilizing the area, a horizontal incision about 2 cm. long was made along the lower border of the mandible to expose the involved region. With an engine-driven spear point bur the cortical bone was removed to expose the crown of the tooth. The tooth was delivered and the socket was curetted and packed with absorbable gelatin sponge (Gelfoam) saturated with 50,000 units of penicillin in 1 cc. of saline. The incision was closed with "C" silk sutures. Another impacted tooth was removed on the right side by the usual intraoral approach.

Remarks

After two days the patient was discharged, apparently in good condition and with little pain locally. There were no swelling or other undesirable symptoms. This case clearly shows the value of complete roentgenographic examination and carefully recorded history.—*236 Westminster Street.*

Complex Composite Odontoma.

By Arthur M. Maris, D.D.S., Oral Surgery Division, Department of Otolaryngology and Oral Surgery, State University of Iowa Hospitals, Iowa City.

A boy, aged 6 years, was referred by the department of pedodontics on March 8, 1946.

The child's parents noticed a bulging of the right premaxillary region about six months before. There had been no symptoms of inflammation.

Examination

Examination disclosed a distinct enlargement on the labial aspect of the right premaxillary region. The mucosa was normal. The right deciduous central and lateral incisors still were in place, whereas the permanent left central incisor was erupted.

Roentgenograms (see illustration) revealed a mass of what appeared to be dental tissue, about 1½ cm. in diameter, directly over the deciduous incisors. The permanent incisors were situated above the mass with considerable deflection of the central incisor.

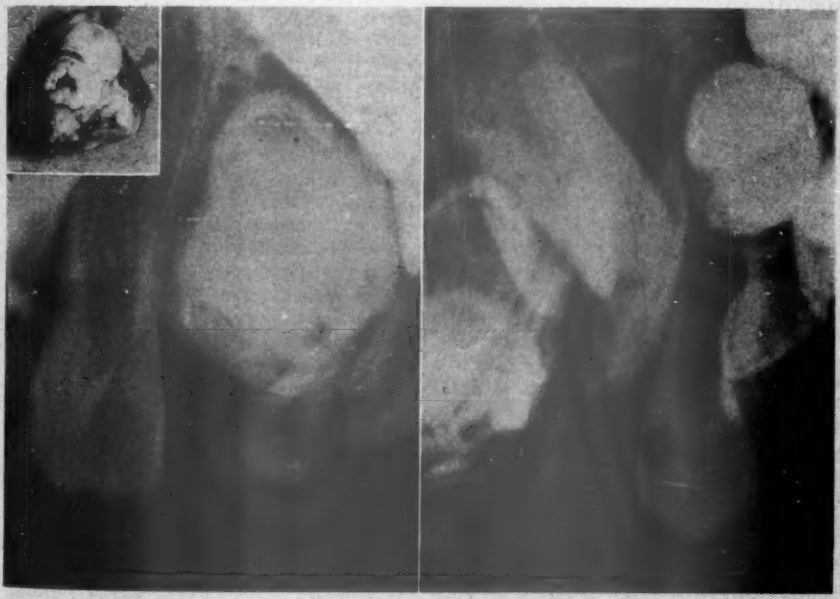
A diagnosis of odontoma was made and operation was performed on April 17, 1946.

Operation

Anesthesia was induced with thiopental sodium and nitrous oxide-oxygen.

After placing a throat pack, an incision was made involving the upper left deciduous incisors, and flaring to the right and left. The mucoperiosteal flap was elevated. The thin bone overlying the tumor was removed with chisels and rongeur forceps. The tumor mass (inset in illustration) was removed easily as it was surrounded by a follicle. The follicular cyst remnants were dissected carefully from the bone and removed. The upper left deciduous incisors were extracted and the flap was replaced and sutured.

The sutures were removed two days later. Healing was uneventful. It was hoped that the permanent incisors would erupt to their normal positions, but the patient did not return for further observation.—*1139 East Court Street.*



Roentgenograms of incisor region and cuspid region, showing odontoma. Inset shows the odontoma after removal

BOOK REVIEWS

A History of Dentistry. By Arthur Ward Lufkin, D.D.S., F.A.C.D. Second edition, enlarged and revised. 367 pages, with 104 illustrations. Price $4.50. Philadelphia: Lea and Febiger, 1948.

The appearance of a second edition of this history two years after publication of a second edition of Bremner's *Story of Dentistry* is a welcome sign of the growing interest of American dentists in the traditions of their profession. It has been enlarged by more than 100 pages by the addition of a review of dental caries and new chapters on dental specialties.

The author's approach in the presentation of this new material is fresh and stimulating, contrasting with the cumbersome arrangement of old material carried over from the first edition. His "Modern Period" consists of separate chapters, one for each country: "Italy," "France," "Germany," "Great Britain-Australia" and "The United States." Since this period is characterized, among other things, by the free exchange of scientific knowledge among nations, an attempt to trace the growth of dental knowledge by means of a separate outline for each country is awkward. For the reader, it is confusing to find Fauchard's views on dental caries in two separate chapters, a short paragraph under "France" and a longer paragraph under "The Evolution of the Concept and Treatment of Oral Disease."

In the preface to his first edition, Dr. Lufkin wrote: "It has been the author's desire to keep this text within small proportions; to present in a simple form the high lights of dental history, embellished with such a chronicle of contemporary events that the reader is able to maintain the proper historical background." This task is not an easy one. If it is to be accomplished at all, without a neglect of the "high lights," it demands the free though judicious use of the pruning knife. Detailed descriptions of ancient and medieval dental remedies, while amusing, should not be included at the expense of an adequate consideration of the work of John Hunter who provided the scientific bedrock upon which much of the present structure of dentistry rests. It is impossible to do justice to his work in half a dozen paragraphs.

Similarly, it would probably have been better to eliminate many such dental oddities as "Queen Elizabeth's Toothache" than to limit to seven paragraphs a chapter as important as "Oral Surgery."

Lufkin's new book lacks the fluidity of Bremner's *Story of Dentistry* and the cohesiveness of Lindsay's *Short History of Dentistry*, but it is an important contribution. Dentistry today requires a brief and accurate survey of the origin and development of many of its procedures and concepts. Although this second edition has its shortcomings, it is, on the whole, a significant step in the right direction. —*L. Laszlo Schwartz.*

Cavity Preparation and Abutment Construction in Bridgework. By Jacob R. Schwartz, D.D.S. 354 pages, with 482 original illustrations. Brooklyn: Dental Items of Interest Publishing Co., Inc., 1948.

According to the author this volume is a treatise on the fundamental principles and the technical phases governing the cutting of cavities or preparations in natural teeth for purposes of anchorage, impression methods for accurate reproduction and the construction of inlays and abutments in acordance with modern successful casting procedures.

The author's aim seems to be to condense information as a reference book in order to bring it within the needs of the student, undergraduate and graduate alike. Features of special service are the many splendid illustrations co-ordinated with explanations of technical procedures.

The author appears to have made every effort, as in previous works, to develop a concise and informative text on the many preparations used as retainers in the construction of bridgework. He has credited those who gave so much of their time and untiring energies to similar work.

There are limitations and possibilities in the making of cavity preparations and at the present time there seem to be no standard forms of preparations to follow. There are other volumes on the subject of preparations for bridgework abutments that present the most typical examples with the most artistic illustrations but it still is quite necessary to develop a sense of inventiveness and a mechan-

ical ability to cope with the many atypical varieties of conditions. However, from this volume the operator may be guided in developing those points.

There are two misleading series of illustrations, one of which shows excessive preparation of extensions involving angles close to pulpal horns. Removal of the entire cusp is not necessary and axial extension need only be a veneer. The other confusing illustrations involve the position of a mounted grinding point, or bur in a handpiece. The lingual approach shown is impossible.

There is an adequate index, a proper bibliography, an index of all of the artistic illustrations and a glossary. This book can be recommended as a valuable reference work for all of those interested in this field.—*O. W. Silberhorn.*

Dental Health Teaching Outline. 4 pamphlets. By Vern D. Irwin, D.D.S., M.P.H. and Netta W. Wilson, M.A. Pamphlet No. 1, 16 pages; No. 2, 22 pages; No. 3, 24 pages and No. 4, 32 pages. St. Paul: Bruce Publishing Company, 1948.

As the titles of these booklets indicate, the authors have presented outlines to help teachers conduct dental health education programs in their classrooms. Suggestions are included for the twelve elementary, junior and senior high school grades.

The authors are to be commended for the practical suggestions and valuable information presented in plain and lucid language. Remarks are addressed to both the teachers and students, with many references so that readers may attain further knowledge on various aspects of dental health. Moreover, the outlines give evidence of timeliness since the latest information is given on diet, toothbrushing and fluorine therapy.—*J. M. Wisan.*

Teeth, Health and Appearance. By American Dental Association. Second edition. Revised. 47 pages, with 139 illustrations. Price $3.50. Chicago: American Dental Association, 1947.

The short, complete and comprehensive title of this book covers the field of dental health education and excites the reader's interest.

While there may be some difference of opinion about the sequence of material, the unity and coherence among chapters is exceptionally good. The general material in each chapter is well prepared and covers the subject in sufficient detail without losing reader interest and the illustrations are by far the best effort of the A.D.A.'s Bureau of Public Information in this field. Intermittent use of black, white and colors in certain drawings and photographs does much to enhance their eye appeal.

The contents are so presented that they could interest persons in any walk of life, but it is apparent that the dental profession still overestimates the ability of the public to understand simple scientific material. It might help to place a short glossary in the front of the book.—*Lester A. Gerlach.*

Eating for Health. By Pearl Lewis, B.S. 121 pages. Price $2.25. New York: The Macmillan Co., 1948.

This is a handbook of basic dietary plans set up by age and sex. The first two chapters provide an introduction to these plans and include a discussion of the benefits to be derived from eating the right kinds of foods. The need for consumption of specific types of foods daily because of their essential dietary factors such as proteins, minerals and vitamins is impressed on the lay reader. The practical information regarding possible substitutions for important foods could well have been expanded for those without considerable nutritional training. Some comparative caloric values would be a good addition.

The brief survey of nutritional processes, including differences in digestibility of the various types of food, is of real interest to the lay person.

There is a break, however, in the continuity of the discussion of eating for health by the inclusion of the chapter on the human body. The subject of the book would have been covered more completely if this chapter had been omitted and a discussion of the environmental factors of nutrition had been substituted. The substitute chapter should contain, for example, a discussion of the importance of eating breakfast and lunch, the danger in depending upon one main meal (dinner) for the bulk of one's daily food, the importance of eating while relaxed and the dangers of gulping food. Simple rules for the overweight and underweight also have a logical place in any discussion of eating for health, but have not been included. Nonetheless, this book is a competent dietary guide.—*Dorothea F. Radusch.*

CURRENT LITERATURE

The Importance of the Vertical Dimensions in Complete Dentures. J. H. Badcock. Brit. D. J. 83:264, December 19, 1947.

A simple method of recording the profile is described as follows:

"Soften in warm water two cakes of Kerr's (or similar) composition, and flatten them between two pieces of glass into a sheet about ⅛ inch thick. Place this on a dental napkin, and both on, say, the lid of a biscuit-tin, and warm over a flame until the composition adheres to the napkin; allow to cool and when nearly stiff cut into ½-inch strips with scissors.

"To use, soften a strip in warm water until quite flaccid, and then, with the patient's head well thrown back, lay the strip, napkin-side downwards, on the face, beginning at the bridge of the nose and following the profile down to beneath the chin, allowing it to adapt itself by its own weight with a little help under nose and chin; then let an assistant dab it gently with a cold swab until hard.

"To strengthen it for preservation wax to each end a copper strip of the same width to enclose a space between it and the composition not less than ¾ inch at any point; lay upon a sheet of glass and fill the space with plaster. When this has set remove the metal for future use."

Development of Bacterial Resistance to Antibiotics. C. Phillip Miller. J.A.M.A. 135:749, November 22, 1947.

Penicillin resistance when it does develop proceeds slowly. It has not as yet become a serious clinical problem because most infections are brought under control before any appreciable degree of resistance has had time to develop and also because most patients at the present time receive doses of penicillin sufficiently in excess of the minimum required to take care of any increase in resistance which might occur during the course of their treatment.

Streptomycin resistance, on the other hand, can develop with great rapidity. This has been observed clinically as well as experimentally. It is probably due to the production by bacteria of streptomycin-resistant variants which arise by mutation. Such variants have been described for several bacterial species. In the case of Meningococcus, two streptomycin-resistant variants have been observed, one of which is remarkable in that it requires streptomycin for its growth *in vitro* and *in vivo*.—*Excerpt from the article.*

Tooth Decay in Relation to Diet and General Health. Nils P. Larsen. J.A.M.A. 137:832, July 3, 1948.

A high incidence of dental caries was found in 1,036 well nourished children selected from a wide variety of racial groups in Hawaii. By contrast, all of the teeth of 48 per cent of a group of 104 poorly nourished children recently arrived in Hawaii were free from caries. Only 11 per cent of the teeth of these latter children were decayed, missing or filled. Their diets were high in crude carbohydrate. Their periodontal condition was not reported.

The literature on the relation between diet and dental caries is partially reviewed and many interesting speculations are offered. Laboratory data on 321 children bear out the expected relation between the Snyder test, lactobacillus counts and incidence of caries.

The author reaffirms earlier observations that diets which are associated with good general health are not necessarily conducive to freedom from dental caries.

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Fluorine in Dentin and Enamel of Sound and Carious Human Teeth. F. J. McClure, National Institute of Health, Bethesda, Md.—287.

***The Incidence of Dental Caries Among Freshman Students at Oregon State College.** Demetrios M. Hadjimarkos and Clara A. Storvick, Oregon State College.—299.

*Further Studies on the Association Between the Products of Protein Putrefaction and Dental Caries Activity. Samuel Dreizen and Tom D. Spies, Northwestern University.—305.
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*Fluoride Mouthwashes, Fluoride Dentifrices, and Other Uses of Fluorides in Control of Caries. Basil G. Bibby, Eastman Dental Dispensary.—367.
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The Present Status of Caries Control Measures. Philip Jay, University of Michigan.—413.
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The Evanston Dental Caries Study. II. Purpose and Mechanism of the Study. J. R. Blayney and Winston H. Tucker.

A short review is given of the methods employed in the Evanston study to determine the value of adding sodium fluoride to public water supplies for the control of dental caries.

Dental clinics are established in the school buildings where proper facilities are available. Some children are transported from nearby schools. Detailed clinical examinations are made on the children in the 6-, 7-, 8-, and 12-, 13-, 14-year age groups. These examinations are supported by a complete roentgenographic survey of the teeth in order to discover initial carious lesions which are inaccessible or too small to be recognized clinically.

The schema for the program, which covers a period of 15 years, indicates the frequency and the age at which the same group of children will be examined. The form used for recording case histories is reproduced to show the effort which is made to evaluate the various factors which may play a role in the caries susceptibility of each child.

The addition of sodium fluoride to the water supply was begun on February 11, 1947. Through February 10, 1948, a total of 81,375 pounds of sodium fluoride had been placed in the city water at an estimated cost of $0.1073 per capita.

At the time of the article, the first examination was being made after one full year of water fluorination, so no data on results are presented.

The Incidence of Dental Caries Among Freshman Students at Oregon State College. Demetrios M. Hadjimarkos and Clara A. Storvick.

A dental examination, which included the use of posterior bite-wing roentgenograms, was made of freshman students at Oregon State College. The students participating were residents of the state and nonveterans, according to the registrar's records. The term "DMF" was used to designate past and present caries experience for teeth and tooth surfaces.

The study revealed the following points:

1. The DMF teeth rates were considerably higher among the freshman students of all age groups examined than among students of the same age groups in several other parts of the country with whom they were compared. The average DMF teeth rate for the 17 year old freshman was found to be 12.2 whereas students of the same age in Hagerstown, Md., San Francisco and New York City had an average of approximately 9.0 DMF teeth.

2. Female students had a higher DMF rate

than males and also had received better dental care.

3. Although their DMF rates were considerably higher, freshman students had fewer missing teeth and fewer teeth requiring extraction than did students in other parts of the United States with whom they were compared.

4. The value of bite-wing roentgenograms as a diagnostic tool was demonstrated.

5. The students who came from the Coast region had the highest and those from the Central Oregon region had the lowest dental caries experience. Plans have been made for local studies of the factors which might be responsible for these differences.

Further Studies on the Association Between the Products of Protein Putrefaction and Dental Caries Activity. Samuel Dreizen and Tom D. Spies.

In a previous publication the authors advanced a working hypothesis whereby the low incidence of dental caries, particularly of the smooth surface type, in endemic pellagrins and persons with chronic nutritional deficiency diseases could be attributed in part to the products of protein putrefaction. The prevalence of chronic periodontal disease is known to be exceedingly high in such patients. *In vitro* studies by the authors demonstrated that dilute solutions of indole and indole-3-acetic acid inhibit acid production in saliva and have an adverse effect on the growth and acid production of a strain of the oral Lactobacillus acidophilus.

In this study the experiments were extended to include skatole, phenol, cresol and a salt of putrescine, all products of the bacterial decomposition of proteins. Relatively dilute solutions of these compounds partially or completely inhibited acid production *in vitro* in 81 of the 83 saliva samples in which dental caries activity was present in the control aliquot. Dilute solutions of some mixtures of these compounds together with indole and indole-3-acetic acid significantly inhibited acid production *in vitro* in all but one of the 34 saliva samples in which caries activity was present in the control aliquot. The action of these compounds appeared to be additive since they were more effective when used in combination than when used alone in the same amounts by weight.

In addition, small amounts of skatole, phenol and cresol, singly and in various combinations with indole, indole-3-acetic acid and a dihydrochloride salt of putrescine, significantly inhibited the growth and acid production of a pure culture of Lactobacillus acidophilus (Hadley) recovered from a carious lesion. It would appear that the products of protein putrefaction may play a significant role in lessening susceptibility to dental caries.

Results of a Three-Year Study of the Effectiveness of Carbohydrate Restriction in Reducing Salivary Lactobacillus Counts. Paul C. Kitchin and Dorothy Permar.

Over a period of three years, saliva specimens from 559 persons were examined in the Ohio State University caries control laboratory for evidence of dental caries activity as indicated by counts of oral lactobacilli. One hundred and thirty-seven individuals were found to be caries inactive; 422 were caries active.

At the time of the article, 216 of the caries-active persons had successfully reduced the salivary lactobacillus count in two weeks by drastic restriction of carbohydrates in the diet. Of these, 138 had completed the seven-week course of dietary treatment, 95 of them finishing with low lactobacillus counts. Twenty-four of the 95 were examined 6 months later, and 21 had retained low counts. Eight of the 21 were examined one year after treatment, and 7 had retained low counts. One individual was examined two years after dietary treatment and the count was still low. These results compare favorably with those obtained by the University of Michigan caries control laboratory.

A Study of the Phosphate Solubility of the Human Enamel Surface. Finn Brudevold.

A quantitative method is presented for measuring the phosphate solubility of the intact enamel surface. Standard surface areas were obtained by melting an impervious wax around closely adapted tin foil disks, 4 mm. in diameter. The disks were removed and the surface areas were exposed to acetate buffer at pH 4 for 10 minutes. The phosphate solubility was measured by determining the amount of phosphate dissolved in the buffer.

Repeated tests on the same surface area showed that the phosphate solubility increased with the depth of penetration. Deciduous teeth had a higher surface solubility than permanent teeth. There was a decrease in the surface solubility after eruption. Ground surfaces were about twice as soluble as intact surfaces.

Repeated tests on the same ground surfaces showed that, in contrast to intact surfaces, their solubility rate decreased with increasing depth of penetration.

Introductory Observations of the Periodontium of the Syrian Hamster. David F. Mitchell.

Grossly and microscopically, the normal structures of the hamster periodontium are similar to those of the rat. A form of periodontal disease accompanied by subgingival impaction of coarse food particles and debris was common among aged stock animals and weanlings. It appeared that a unique type of periodontal disease associated with subgingival accumulations of a soft white material was induced by feeding a fine caries-producing diet. A lack of coarse bedding such as wood shavings may predispose to this type of affliction.

Since the hamster appears to be highly susceptible to periodontal disease, it is recommended as a tool for research in periodontia.

Electrochemical Impulse Theory of Dental Pain. W. E. Annis.

The electrochemical theory is an original collection of principles intended to explain clinical observations on dental pain and, also, why and how pain is transmitted through a tooth.

A series of experiments was carried out to show that the tooth acts as a battery when wetted with various solutions. An electrical charge has been shown to pass through a tooth instead of staying on the surface. This causes an impulse of pain in the pulp even though dentinal fibrils are not nervous tissue. Excepting heat and cold, no pain impulse other than electrochemical can be transmitted through all tooth structures.

An Evaluation of the Effectiveness as a Caries Control Measure of the Topical Application of Solutions of Fluorides. John W. Knutson.

Chemical, laboratory and clinical studies are considered in evaluating the effectiveness of topical applications of fluoride solutions as a caries control measure. Important variables to be considered in appraising the results of clinical studies are: number of cases in the group, method of control and treatment, technic of application, age of group, kind of fluoride salt and its concentration, and tooth cleansing prior to topical application.

A review of the evidence leads to the following summary:

1. An increase in the time interval between applications of the fluoride solution in a given series of applications may be expected to postpone attainment of full caries-prophylactic effect.

2. The clinical use of fluoride solutions other than sodium fluoride must be considered experimental until they have been subjected to controlled clinical tests.

3. Until laboratory findings have been verified by the results of clinical studies, the pH of the fluoride solution should not be altered.

4. Preliminary indications are that a 1 per cent solution of sodium fluoride is as effective as a 2 per cent solution, but lower concentrations have not been tested adequately.

5. Omission of tooth cleansing prior to a series of topical fluoride applications reduces the caries-inhibiting effect of the treatment by about half.

6. The results of investigations made so far have demonstrated the caries-prophylactic effect of topical applications of sodium fluoride to the teeth of children. Very limited and inadequate data are available on the effect on the teeth of adults.

The clinical evidence demonstrates conclusively that four applications of a 2 per cent solution of sodium fluoride, in which the initial application is preceded by tooth cleansing, will effect a 40 per cent reduction in new dental decay.

The Effectiveness of the Topical Application of Silver Salts in the Control of Caries. Helmut A. Zander.

The literature on the effectiveness of topical application of silver salts to tooth substance as a protection against caries is reviewed critically. An obstruction of the organic material or an alteration of the inorganic material of tooth structure, or both, may be the mechanism by which application of silver salts affords protection to enamel.

Fluoride Mouthwashes, Fluoride Dentifrices, and Other Uses of Fluorides in Control of Caries. Basil G. Bibby.

The clinical use of topical fluoride therapy by methods other than direct application of sodium fluoride to the teeth is reviewed. Most of the work reported upon was carried out by the author and his co-workers.

Three studies on the use of mouthwashes are discussed. Two gave questionable results, and one using an acidulated mouthwash produced an increased activity of dental caries in children. Three studies using liquid and paste dentifrices containing fluoride gave negative results, but a study is reported in which powdered fluorapatite was credited with a 60 per cent reduction of caries. Three studies using a prophylactic cleaning mixture of pumice, hydrogen peroxide and sodium fluoride gave two positive results and one negative result. Dr. Bibby questions a report on the caries reduction resulting from the use of calcium fluoride lozenges. Another short term study with the same lozenges failed to reveal a reduction in the lactobacillus count. In experiments duplicating the author's Brockton study, which first demonstrated the effectiveness of sodium fluoride applications in reducing dental caries, no caries reduction resulted from applications of lead fluoride or indium nitrate.

The Physical Consistency of Food and Refined Carbohydrate Restrictions—Their Effect on Caries. Hermann Becks.

This article is essentially a summary of a clinical investigation which was conducted at the University of California during the last 10 years to test on a broad basis the prevailing concept that a reduction of caries activity can be accomplished by reducing an intake of excessive refined carbohydrate and thereby decreasing the number of lactobacilli in the oral cavity. These studies were in no way aimed at a search for the cause of dental caries. The findings indicate that the fundamental work of Bunting, Jay and co-workers could be confirmed with the following conclusions:

1. Reduction of the Lactobacillus acidophilus index can be obtained within a period of a few weeks by reducing the intake of excessive refined carbohydrates and increasing the intake of milk and milk products, meat, eggs and vegetables to furnish the required calories.

2. The high degree of success of this program establishes the reduction of refined carbohydrates as an effective means of reducing the oral Lactobacillus acidophilus index.

3. In a group of 665 cooperative patients with rampant dental caries, the reduction or elimination of oral lactobacilli was accompanied by a decrease in caries incidence in 88.4 per cent, or 588 persons.

4. A program of dental caries control or prevention is entirely practical and effective in private practice and in institutional and public health work.

The Relative Errors of Bacteriological Plate Counting Methods. Thomas L. Snyder. J. Bact. 54: 641, November 1947.

Since it is claimed that the extent of variation encountered with dilution plate counting methods is larger than the maximum permitted, for example, in routine chemical analyses, five bacteriologic plate counting methods were compared with respect to the magnitude and reliability of the counts obtained with Shigella dysenteriae.

The coefficients of variation of the five plating methods were not significantly different, even though the coefficients of variation of the three methods of measuring aliquots of inoculum into plates did differ significantly. No significant contribution to the total error can be expected from the pipetting methods used unless the total error is considerably less than that observed in this study. Efficient spreading of the inoculum in the case of surface plating methods increased the counts obtained. The rolled tube method gave a significantly higher count than the poured plate method.

In using any plate count method it is well to keep in mind the danger of spontaneous agglutination, errors in preparing a dilute suspension, errors involved in measuring aliquots for inoculum, the distribution of the organisms in or on the growth media and factors which influence the development of the inoculated cells into visible colonies.—*George W. Burnett.*

DEATHS

Abelson, Arthur, Merrick, N. Y.; College of Dentistry, University of Illinois, 1941; died August 22; aged 32.

Anderson, Roy G., Grand Rapids, Mich.; Department of Dental Surgery, Detroit College of Medicine, 1906; died August 9; aged 64.

Baker, George T., Woodville, Mass.; Tufts College Dental School, 1880; died August 30; aged 92.

Barber, Jr., Henry U., Scarsdale, N. Y.; School of Dentistry, University of Pennsylvania, 1916; died August 16; aged 54.

Barlow, Myron, Braintree, Mass.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1891; died August 13; aged 81.

Barnett, William L., Manchester, Tenn.; Louisville College of Dentistry of Centre College, 1906; died June 28.

Barnsback, Chalmer, Chicago; Dental School, Northwestern University, 1908; died August 19; aged 67.

Barton, E. D., Birmingham, Ala.; College of Dentistry, University of Tennessee, 1898; died in July; aged 78.

Bell, Horace J., Hartford, Ky.; Louisville College of Dentistry of Centre College, 1909; died September 18; aged 66.

Berks, Pliny W., Watertown, Mass.; Tufts College Dental School, 1902; died May 21; aged 72.

Billman, George G., Sullivan, Ind.; School of Dentistry, Indiana University, 1892; died July 24; aged 79.

Black, James C., Bigelow, Ark.; died July 5; aged 82.

Bond, Rufus J., St. Louis; School of Dentistry, Washington University, 1941; died August 14; aged 36.

Booth, John D., Seattle; School of Dentistry and the Baltimore College of Dental Surgery, University of Maryland, 1891; died August 1; aged 94.

Bott, Clarence J., Rochester, N. Y.; College of Dental Surgery, University of Michigan, 1917; died June 28; aged 53.

Boughton, Seymour S., Glen Ridge, N. J.; died August 23; aged 78.

Bradbury, A. R., Chicago; School of Dentistry, Vanderbilt University, 1916; died July 5; aged 59.

Brooks, May L., Memphis, Tenn.; Dental School, Northwestern University, 1900; died July 23; aged 75.

Broussard, Rene J., New Iberia, La.; School of Dentistry, Loyola University, 1919; died May 13; aged 52.

Burks, E. E., Hazlehurst, Miss.; School of Dentistry, Vanderbilt University, 1906; died June 1; aged 75.

Calkins, H. J., Shawano, Wis; Chicago College of Dental Surgery, 1907; died in July; aged 80.

Cameron, John H., Caledonia, N. Y.; School of Dentistry, University of Buffalo, 1896; died July 12; aged 73.

Cargill, William L., Belfast, Me.; Tufts College Dental School, 1903; died June 17.

Claflin, Roland S., Park Ridge, Ill.; Chicago College of Dental Surgery, Loyola University, 1925; died July 31; aged 47.

Clancy, Frederic V., Holliston, Mass.; Tufts College Dental School, 1915; died August 19; aged 55.

Clarke, Rosiland, Covington, Ohio; School of Dentistry, Western Reserve University, 1921; died July 27.

Cockrell, Alvin C., Hazlehurst, Miss.; Atlanta Dental College, 1915; died July 23; aged 62.

Coffin, Carl S., Pittsfield, Me.; School of Dentistry, University of Pennsylvania, 1905; died July 6; aged 71.

Condit, Frank L., Wilmette, Ill.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1892; died August 5; aged 82.

Copeland, Clarence S., Rochester, N. H.; Philadelphia Dental College, 1896; died July 9; aged 78.

Corn, Max, Los Angeles; New York College of Dentistry, 1914; died August 14; aged 62.

Crawford, Arthur B., Alliance, Ohio; College of Dentistry, University of Illinois, 1909; died June 16; aged 68.

Crow, Jesse L., Somerset, Pa.; School of Dentistry, University of Pittsburgh, 1900; died August 23; aged 76.

Davenport, Lewis C., Moorhead, Minn.; Ohio College of Dental Surgery, Dental Department of the University of Cincinnati, 1880; died July 27; aged 89.

Davidson, Emanuel, Norwalk, Conn.; School of Dentistry, University of Pennsylvania, 1924; died July 25; aged 45.

Davis, Charles E., Dayton, Ohio; Dental School, Northwestern University, 1902; died July 22; aged 69.

Davis, Frank C., Brooklyn; College of Dental and Oral Surgery of New York, 1913; died July 10.

Delp, Garrett H., Alexandria, Va.; School of Dentistry, Medical College of Virginia, 1917; died September 1; aged 52.

Derby, Frank A., North Cambridge, Mass.; Tufts Dental College, 1911; died July 31; aged 61.

Deyoe, Arthur, Detroit; College of Dental Surgery, University of Michigan, 1891; died June 19; aged 80.

Duprey, Harry C., Clinton, Mass.; died July 16; aged 58.

Ehleider, Thomas J., Poughkeepsie, N. Y.; died June 26; aged 81.

Fahy, George C., New Haven, Conn.; School of Dentistry, University of Pennsylvania, 1905; died August 2; aged 66.

Farrand, G. H., La Crosse, Wis.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1895; died June 24; aged 76.

Fast, Sidney L., Far Rockaway, N. Y.; died July 5.

Felt, Leon R., Emporium, Pa.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1905; died March 29; aged 62.

Fisher, Ernest M., Medford, Mass.; Tufts College Dental School, 1914; died July 12; aged 57.

Fitzgerald, Michael A., Albany, N. Y.; Pennsylvania College of Dental Surgery, 1907; died July 3.

Flagg, Lloyd E., Buffalo; Harvard University Dental School, 1925; died July 13; aged 49.

Foote, Charles E., Ballston Spa, N. Y.; died July 28; aged 92.

Ford, S. C., Franklinton, N. C.; School of Dentistry and the Baltimore College of Dental Surgery, University of Maryland, 1907; died September 6; aged 72.

Forrest, James M., San Francisco; College of Dentistry, University of California, 1896; died June 9; aged 74.

Fortain, Henry J., Detroit; Department of Dental Surgery, Detroit College of Medicine, 1902; died August 2.

Foster, Harry, Indianapolis; School of Dentistry, Indiana University, 1925; died August 22; aged 59.

Frederickson, Marcus, Aitkin, Minn.; College of Dentistry, University of Minnesota, 1906; died August 22; aged 65.

Fuchs, Samuel, Far Rockaway, N. Y.; died July 10; aged 57.

Gernerd, E. E., Bethlehem, Pa.; died July 20.

Gethro, Joseph C., Norwood, Mass.; Tufts College Dental School, 1909; died July 1; aged 78.

Gordon, Charles, Pittsburgh; School of Dentistry, University of Pittsburgh, 1921; died August 20; aged 52.

Graham, James A., San Francisco; College of Dentistry, University of Iowa, 1908; died August 16; aged 68.

Greenwell, Howard, Ogden, Utah; College of Dentistry, University of Southern California, 1941; died September 14; aged 36.

Groves, Floyd E., Eldorado, Ill.; School of Dentistry, Washington University, 1924; died July 11; aged 46.

Gunkel, John H., Newport, Ky.; Cincinnati College of Dental Surgery, 1909; died July 24; aged 63.

Gutteridge, John H., Lexington, Ky.; died June 26; aged 57.

Haar, Carl J., Carrollton, Mo.; Kansas City-Western Dental College, 1921; died April 19; aged 50.

Hahn, Morton S., New York; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1908; died August 31; aged 62.

Hall, Harry D., Berkeley, Calif.; College of Dentistry, University of California, 1929; died July 23; aged 49.

Hancock, A. R., Laddonia, Mo.; St. Louis Dental College, 1906; died July 25; aged 66.

Hebert, Arthur H., Fall River, Mass.; Baltimore College of Dental Surgery of the University of Maryland, 1915; died July 19; aged 52.

Hellwig, Melchior J., Kokomo, Ind.; Baltimore College of Dental Surgery, 1895; died August 5.

Hennebery, Philip A., Mattapan, Mass.; Tufts College Dental School, 1910; died August 14.

Herwig, Conrad A., Allentown, Pa.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1900; died August 11; aged 73.

Hevner, George W., Williamsport, Pa.; School of Dentistry, Temple University, 1926; died September 2; aged 48.

Hewitt, Lewis, Richmond, Calif.; College of Dentistry, University of California, 1921; died August 5; aged 67.

Higgins, John N., Chilton, Wis.; Chicago College of Dental Surgery, 1898; died June 28; aged 79.

Hiner, Edwin M., Los Angeles; died July 19; aged 76.

Hobbes, C. Elmer, Kingston, Pa.; Pennsylvania College of Dental Surgery, 1901; died August 29; aged 80.

Hoff, Edward R., Brooklyn; died July 23; aged 83.

Holter, Willard C., Lock Haven, Pa.; School of Dentistry, University of Pittsburgh, 1929; died July 27; aged 47.

Hough, Lewis, Orangeburg, S. C.; School of Dentistry, University of Pennsylvania, 1923; died June 9; aged 53.

Hough, William H., Jr., Philadelphia; School of Dentistry, University of Pennsylvania, 1914; died June 30; aged 61.

Houston, Claude D., St. Louis; Chicago College of Dental Surgery, 1903; died July 28; aged 68.

Howard, James T., Langhorne, Pa.; School of Dentistry, Temple University, 1902; died July 14; aged 76.

Hughes, B. N., Mendota, Ill.; Chicago College of Dental Surgery, 1901; died July 27; aged 72.

Hutchinson, Chester B., Lakeland, Fla.; Southern Dental College, 1906; died June 23; aged 65.

Irish, George O., New Bedford, Mass.; Tufts College Dental School, 1896; died in May.

Johnson, Albert, Portland, Me.; Dental School, Harvard University, 1921; died July 3; aged 53.

Jordan, James B., Middletown, Ky.; School of Dentistry, University of Louisville, 1900; died August 5; aged 75.

Jung, William R., Eagle Bend, Minn.; College of Dentistry, University of Minnesota, 1906; died September 13.

Kalb, George V., Tremont, Pa.; Pennsylvania College of Dental Surgery, 1905; died September 5; aged 64.

Kay, W. E., Turner, Mich.; School of Dentistry, University of Buffalo, 1915; died September 9; aged 77.

Kearns, Leo P., Louisville, Ky.; died September 18.

Keeler, Fred W., Beaverton, Ore.; died September 7; aged 77.

Keene, George W., Port Orange, Fla.; died May 24; aged 69.

Kellams, E. R., Los Angeles; died July 23; aged 60.

Kelly, John L., New York; died June 22; aged 75.

Kendall, W. E., Manhattan, Kans.; died May 1; aged 77.

Kennedy, John F., Chicopee, Mass.; died August 25; aged 55.

Kennedy, Samuel J., Staten Island, N. Y.; New York College of Dentistry, 1887; died August 24; aged 81.

King, Thomas H., Newton Highlands, Mass.; Tufts College Dental School, 1920; died August 3; aged 52.

Konen, Lloyd W., Fond du Lac, Wis.; died July 16; aged 33.

Kraft, Karl, Evansville, Ind.; died August 26; aged 50.

Kronfeldt, Maurice S., Brooklyn; New York College of Dentistry, 1913; died August 21; aged 63.

Kuhl, Frederick G., Woonsocket, R. I.; died August 25; aged 85.

Lamme, Berry, Las Animas, Colo.; School of Dentistry, University of Denver, 1922; died July 14; aged 50.

Leattor, William J., Doylestown, Pa.; died July 21; aged 74.

Leet, Don S., Wilkinsburg, Pa.; Baltimore College of Dental Surgery, 1901; died July 6; aged 77.

Leininger, Michael, Chicago; Chicago College of Dental Surgery, 1890; died June 20; aged 83.

Leonard, David C., Toledo, Ohio; School of Dentistry, University of Pittsburgh, 1919; died September 1; aged 51.

Letcher, James H., Danville, Ky.; died September 14; aged 89.

Levenson, Edward J., Detroit; died April 5; aged 44.

Lindsay, E. H., Altoona, Ala.; Birmingham Dental College, 1915; died March 4; aged 59.

Logan, Thomas H., Chicago; College of Dentistry, University of Illinois, 1905; died March 12; aged 64.

Lord, Charles, Michigan Center, Mich.; died May 30; aged 73.

Lorenz, Elmer E., Mt. Lookout, Ohio; Ohio College of Dental Surgery, University of Cincinnati, 1916; died August 2; aged 52.

Loud, William A., Rockland, Mass.; Boston Dental College, 1898; died March 29; aged 73.

Lowell, William H., Washington, D. C.; died April 25; aged 87.

Lusardi, John, Jersey City, N. J.; Baltimore College of Dental Surgery of the University of Maryland, 1925; died May 7; aged 50.

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MEETINGS OF STATE SOCIETIES

State	Date	Place	Secretary	Address
Alabama	May 2-4, 1949	Biloxi	G. W. Matthews	1922 Tenth Ave., S., Birmingham 5
Arizona			H. G. DeWolf	Valley National Bank Bldg., Tucson
Arkansas	Nov. 21-23	Little Rock	D. M. Hamm	Clarksville
California			L. E. Linehan	450 Sutter St., San Francisco
S. California	April 4-6, 1949	Los Angeles	M. E. Ralston	903 Crenshaw Bldg., Los Angeles 6
Colorado	May 25-27, 1949	Colorado Springs	R. A. Downs	724 Republic Bldg., Denver 2
Connecticut			E. S. Arnold	37 Linnard Rd., W. Hartford
Delaware			G. Zurkow	301 Medical Arts Bldg., Wilmington 9
D. of Columbia			K. H. Wood	202-1835 Eye St., N. W., Washington
Florida	Dec. 12-15	Hollywood	J. I. Todd	433 St. James Bldg., Jacksonville
Georgia			J. M. Heard, Jr.	Persons Bldg., Macon
Hawaii			J. W. Dawe	P. O. Box 39, Honolulu 10
Idaho			R. Sutcliff	Twin Falls
Illinois	May 9-12, 1949	Peoria	P. W. Clopper	623 Jefferson Bldg., Peoria
Indiana	May 16-18, 1949	Indianapolis	E. E. Ewbank	Kingman
Iowa	May 2-4, 1949	Des Moines	H. I. Wilson	417 Higley Bldg., Cedar Rapids
Kansas			F. A. Richmond	1008 Huron Bldg., Kansas City
Kentucky	April 3-6, 1949	Louisville	A. B. Coxwell	1976 Douglas Blvd., Louisville
Louisiana	June 1-4, 1949	New Orleans	J. S. Bernhard	407 Medical Arts Bldg., Shreveport
Maine			P. W. Anderson	32 Deering St., Portland 3
Maryland			E. L. Passagno, Jr.	415 Medical Arts Bldg., Baltimore 1
Massachusetts	May 2-5, 1949	Boston	P. E. Adams	227 Commonwealth Ave., Boston 16
Michigan	April 11-13, 1949	Detroit	F. Wertheimer	Michigan Department of Health, Lansing
Minnesota	Feb. 21-23, 1949	Minneapolis	C. V. E. Cassel	Lowry Medical Arts Bldg., St. Paul
Mississippi	April 10-13, 1949	Vicksburg	F. C. Sneed	Osyka
Missouri	April 10-13, 1949	St. Louis	C. W. Digges	Exchange National Bank Bldg., Columbia
Montana	May 5-7, 1949	Bozeman	C. S. Renouard	305 Phoenix Bldg., Butte
Nebraska	May 9-11, 1949	Lincoln	F. A. Pierson	Federal Securities Bldg., Lincoln
Nevada	June 3-4, 1949	Reno	L. G. Jacob	505 Chestnut St., Reno
New Hampshire			F. E. Williams	814 Elm St., Manchester
New Jersey	April 27-29, 1949	Atlantic City	J. G. Carr	407 Copper St., Camden
New Mexico			J. S. Eilar	First National Bank Bldg. Albuquerque
New York	May 10-13, 1949	Buffalo	C. A. Wilkie	1 Hanson Place, Brooklyn
North Carolina	May 19-21, 1949	Pinehurst	R. F. Hunt	Rocky Mount
North Dakota	May 8-11, 1949	Bismarck	A. L. Smeby	Northwood
Ohio	Nov. 7-10	Columbus	E. G. Jones	185 E. State St., Columbus
Oklahoma	April 10-13, 1949	Oklahoma City	F. H. Binkley	Hennessey
Oregon	Feb. 28-Mar. 2, 1949	Portland	W. H. Hurley	722 Selling Bldg., Portland 5
Panama Canal Zone			R. O. Leon	Box 1094, Ancon
Pennsylvania			E. R. Aston	421 Market St., Kingston
Puerto Rico			E. Capo	9 Villa St., Ponce
Rhode Island			A. A. Albert	84 Broad St., Pawtucket
South Carolina	May 1-3, 1949	Myrtle Beach	J. R. Owings	201 E. North St., Greenville
South Dakota	May 5-17, 1949	Aberdeen	E. W. Elmen	Sioux Falls
Tennessee	May 16-19, 1949	Knoxville	E. J. Justis	Exchange Bldg., Memphis
Texas	May 2-5, 1949	Houston	W. Ogle	313 Medical Arts Bldg., Dallas
Utah			S. Ballinger	1001 Tribune-Telegram Bldg., Salt Lake City
Vermont	May 22-24, 1949	Woodstock	J. A. Larrow	Middlebury
Virginia	April 11-13, 1949	Roanoke	J. E. John	804 Medical Arts Bldg., Roanoke
Washington			F. J. Dingler	1502 Medical & Dental Bldg., Seattle 1
West Virginia	May 16-18, 1949	Wheeling	C. J. Gavelda	Clarksburg
Wisconsin	April 19-21, 1949	Milwaukee	K. F. Crane	1233 Bankers Bldg., Milwaukee 2
Wyoming			J. D. McNiff	208 Grand Ave., Laramie

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

State	Date	Place	Secretary	Address
California	Feb. 7, 1949 June 13, 1949 July 25, 1949	San Francisco Los Angeles San Francisco	K. I. Nesbitt	Room 307, 507 Polk Street San Francisco 2
Connecticut	Nov. 16-20	Hartford	C. G. Brooks	New London
D. of Columbia	Jan. 10-14, 1949	Washington	D. S. Thorn	1726 Eye St., N. W., Washington
Indiana	Nov. 8-11	Indianapolis	Carl A. Frech	504 Broadway, Gary
Maryland	Nov. 8-10	Baltimore	K. W. Preis	700 Cathedral St., Baltimore 1
Michigan	Feb. 7-12, 1949 May 23-28, 1949	Ann Arbor Ann Arbor	J. L. Champagne	502 David Whitney Bldg., Detroit 26
Minnesota	Jan 3-8, 1949	Minneapolis	E. E. Comartin	334-100 First Avenue Bldg. Rochester
Mississippi	Jan. 11, 1949	Jackson	J. C. Boswell	508 Lamar Life Bldg., Jackson
New Jersey	Nov. 29-Dec. 3 June 6-10, 1949		W. A. Wilson	150 E. State St., Trenton
Oregon	Dec. 6-9	Portland	F. L. Utter	506 Pioneer Trust Bldg., Salem
Pennsylvania	Dec. 6-11	Philadelphia	R. E. V. Miller	Northampton National Bank Bldg., Easton
Tennessee	Dec. 13-17	Memphis	J. J. Vaughn	1005-6 Medical Arts Bldg., Nashville 3
West Virginia	June 27-29, 1949	West Liberty	R. H. Davis	510-16 Goff Bldg., Clarksburg

OTHER MEETINGS

Name	Date	City	Secy. or Chm.	Address
Academy of Denture Prosthetics	June 13-18, 1949	Indianapolis	I. L. Furnas Secy.	928 Silverado St. La Jolla, Calif.
American Academy of Dental Medicine	Dec. 5	Pennsylvania	W. M. Greenhut Secy.	124 East 84th St., New York 28
American Board of Orthodontics	April 28- May 1, 1949	New York	S. C. Hopkins Secy.	1726 Eye St., N. W., Washington 6, D. C.
American Public Health Association, Seventy-Sixth Annual Meeting	Nov. 8-12	Boston	R. M. Atwater Secy.	1790 Broadway, New York 19
Chicago Dental Society, Mid-Winter Meeting	Feb. 7-10, 1949	Chicago	A. L. Brett Secy.	30 N. Michigan Ave. Chicago
Denver Dental Association, Forty-Second Annual Mid-Winter Meeting	Jan. 9-12, 1949	Denver	H. A. Neuman Secy.	724 Republic Bldg., Denver
Detroit District Dental Society, Seventh Annual Dental Review	Nov. 3-4	Detroit	L. A. Katzin Gen'l Chm.	4421 Woodward Ave., Detroit 1
Federacao Odontologica Brasileiro, Fourth Congresso	July, 1949	Recife, Brazil	R. Ewerton	277 Avenida Rio Branco, Rio de Janeiro
Greater New York Dental Meeting, Twenty-Fourth Annual Meeting	Dec. 6-10	New York	Mabel Purdy Secy.	Rm. 106A, Hotel Pennsylvania, New York 1
Greater Philadelphia Annual Meeting	Feb. 2-4, 1949	Philadelphia	R. Adams Secy.	501 Stock Exchange Bldg., Philadelphia 2

Name	Date	City	Secy. or Chm.	Address
Mid-Continent Dental Congress, St. Louis Dental Society, Eighth Annual Meeting	Nov. 21-24	St. Louis	L. M. Shanley Chm.	7800 Maryland Ave., Clayton
National Board of Dental Examiners	Dec. 6-7*		G. L. Teall Secy.	Box 71, Hiawatha, Kan.
Northwestern Society of Orthodontists	Nov. 21-22	New York	O. Jacobson Secy.	35 West 81st St., New York
Pan American Odontological Association, Twelfth Annual Dinner Meeting	Dec. 8	New York	R. H. Brodsky Exec. Secy.	14 E. 81st St., New York
Seventh Pacific Science Congress	Feb. 2-8, 1949 Feb. 16-22, 1949	Auckland, N. Z. Christchurch, N. Z.	G. Archey Secy.	Seventh Pacific Science Cong., Auckland Institute & Museum, Box 27, Newmarket, Auckland, S. E. 1, New Zealand
Thomas P. Hinman Mid-Winter Clinic, Thirty-Sixth Annual Meeting	Mar. 20-23, 1949	Atlanta	J. A. Broach Chm.	1105 Doctors Bldg., Atlanta, Ga.
Twenty-Third Journees Dentaires de Paris	Nov. 24-28	Paris	Robert DuPont Secy.	29 Boulevard Malesherbes, Paris 8
University of Kansas City, School of Dentistry, Kansas City-Western Dental College, Alumni Association, Annual Dinner	Mar. 21-22, 1949	Kansas City	C. W. Sawyer Secy.	1108 E. Tenth St., Kansas City 6

*Examinations will be held in schools where there are five or more candidates.